THREE ESSAYS ON THE INFLUENCES OF THE SOCIAL ENVIRONMENT ON BEHAVIOR: FINDINGS FROM SUB-SAHARAN AFRICA

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THREE ESSAYS ON THE INFLUENCES OF THE SOCIAL ENVIRONMENT ON BEHAVIOR: FINDINGS FROM SUB-SAHARAN AFRICA

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My research advances our sociological understanding of when and why Africans feel better or worse about their standard of living, what role peers play in decision-making, and challenges core assumptions about relative deprivation and subjective wellbeing. First, analyzing quasi-experimental data collected from northern Kenya, I demonstrate that peer monitoring by other respondents shapes respondents' choices between cash and food transfers. I interpret the increased likelihood of treated respondents choosing food rather than cash to indicate that in this area, where food is shared but cash may not, being monitored acts as a framing effect that encourages compliance with sharing-norms. Second, examining subjective wellbeing for ten sub-Saharan countries, I find that institutional attributes not commonly considered, such as the level of crime, strongly affect the reported wellbeing of respondents. Relatedly, economic inequality within spatially-constructed reference groups matters. The positive impact of an increase in economic wellbeing on subjective wellbeing is larger in higher inequality areas relative to lower inequality areas. Third, the influence of reference groups' economic status on subjective wellbeing is highly sensitive to reference group construction. Using micro-level data from rural Ghana, I find improvements to the economic status of spatially-constructed reference groups result in relative

deprivation. Yet, utilizing reference groups constructed from social network data on gift-receipt or trust yields more complex findings. Respondents' subjective economic welfare improves when their social networks' assets increase and expenditures decrease. That is, respondents feel better when their social networks are wealthy but thrifty, potentially indicating that respondents hope to draw on their social networks in time of need.

BIOGRAPHICAL SKETCH

Erin C. Lentz is an Assistant Professor of International Relations at Bucknell University and will be an Assistant Professor at the Lyndon B. Johnson School of Public Affairs at The University of Texas at Austin, starting in the fall of 2014. She holds an MS in Applied Economics and Management, also from Cornell. Erin's dissertation work examines reference groups, inequality, and subjective wellbeing in sub-Saharan Africa. Over the past decade, she has published extensively on issues of food assistance and food security in both academic and policy venues. Erin received a Fulbright Fellowship to Bangladesh to research the secondary effects of food aid in local communities. She subsequently worked with CARE USA's Food Resource Coordination Team, where she co-developed and field-tested the Market Information and Food Insecurity Response Analysis (MIFIRA) framework. Recently, Erin worked with the Local and Regional Procurement (LRP) Learning Alliance to develop, implement and evaluate indicators of LRP performance.

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The views expressed are solely mine and do not represent any official agency. Any remaining errors are mine alone.

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CHAPTER 1

INTRODUCTION

Introduction

In this dissertation, I address a key quandary in discussions of development and wellbeing. I examine how social environments influence individuals' decisions and perceptions of their lives. Substantial attention in social science research and policy debates has been paid to modeling decision-making in markets, communities, local and national politics, and development. Understanding the factors that influence such decisions is critical for mapping issues from sociopolitical stability to the success or failure of development interventions. Many development projects, as well as much social science literature, are based on (often implicit) assumptions about the way material inequalities and community characteristics and norms shape decision-making.

I argue that the influence of the social environment is often overlooked, particularly with respect to studies of subjective wellbeing. I take the social environment to include social norms, social networks, structures and institutions, both formal and informal. If we are to understand how people make decisions, we need a better understanding of what roles social environmental factors play in peoples' lives and their perceptions of their lives, particularly in low-income countries. As a result of the tendency to treat the social environment as a series of "control" variables (if it is considered at all), we often do not articulate whether and how the social environment influences decisions. Further, little is known about how the social environment frames field experiments. In the following Chapters, I find that a variety of components of social environments, including reference groups, social networks, average health

status within a community, and crime rates, influence both individuals' choices and how they perceive their lives.

Nonetheless, my call for a focus on the influence of social environments is not new. Researchers on institutions, social networks and social norms readily acknowledge the influence of a social environment on individuals (e.g., Durkheim 1951 (1897), Granovetter 1983, North 1981, Henrich et al. 2001, Horne 2001). Inkeles and Smith (1974), in their classic study of modernity, write, "If we are to understand the human meaning of the new types of social environment we build …, we must conduct more systematic studies of the ways in which the institutional and organizational milieus we create shape the responses of the people who work for them" (p. 11).

More recently, Ferguson (2006) argues that social environments in sub-Saharan Africa are fluid and hybridized. As a result of the unevenness of 'globalization', some communities have become more entwined with international markets, culture, and information, others have been relatively isolated from change, and still others have are more hybridized. Communities in sub-Saharan African experience "highly selective and spatially encapsulated forms of global connection and exclusion" (Ferguson 2006, p. 14). The unevenness of change within low-income countries results in residents facing evolving and competing approaches to livelihoods while simultaneously gaining an understanding of what life is like beyond their own immediate experiences (Ferguson 2006). Even when it is readily acknowledged that norms, social networks, communities and institutional factors often shape individual's decisions, we often do not know how strong the influence of any particular aspect of

the social environment is within low-income countries. I aim to partially address these gaps by unpacking which aspects of the social environment directly influence decisions and subjective wellbeing.

Arguing that social norms in low-income countries are similarly fluid, Fafchamps (2011) writes, "multiple sets of partially conflicting norms [shared understandings about behavior and attitudes] are required for development" (p. 21308). In other words, in a dynamic social environment, people may need to choose among several norms, for example norms emphasizing loyalty to family or respect of contractual obligations. Chapter 2 presents findings from a randomized experiment in northern Kenya. We isolate sharing norms within communities that influence the relative payoffs of different outcomes, which my co-authors and I describe as a "reputation effect." We find that the social norm of sharing food increases the likelihood of respondents choosing food over cash when respondents are being monitored by peers, and we hypothesize that these decisions "build" their reputations as norm abiding.

Just as there is limited understanding of how social norms influence decisions, there is also limited understanding of how institutional attributes influence subjective wellbeing, if at all. This is particularly true in developing countries, where the limited research has tended to focus on reference group attributes but have rarely incorporated other environment factors, such as access to public goods (Fafchamps and Shilpi 2008). In Chapters 3 and 4, I present evidence that institutional attributes influence individuals' lives and that the influence of reference groups' economic status on subjective wellbeing is highly sensitive to reference group definition.

Psychologists Diener et al. (2002) define subjective wellbeing (SWB) as " a person's cognitive and affective evaluations of his or her life" (p. 63). I argue that how a person feels about his or her life is almost certainly related to his or her community and the surrounding policy environment. As sociologists such as Merton and Kitt (1950), Runciman (1966), Andrews and Withey (1976), Campbell et al. (1976), and others have long argued, measures of income and wealth serve as incomplete predictors of peoples' perceptions of their lives.[1] Diener et al. (1999) confirm the finding that income and wealth have a limited effect on our happiness, arguing that "the data do not support a strong causal path from income to SWB" (p. 288).

In Chapter 3, I examine the correlates of subjective wellbeing, including not only individual characteristics but also factors in the social environment, such as crime rates and reference group attributes. Relatively few researchers examine the roles of public goods provisions or access to services on subjective wellbeing in low-income countries. One exception is Easterlin et al. (2011) who report that urban residents in low-income countries tend to be happier than rural residents. But they do not offer insight into what attributes of city-life contribute to the improved sense of wellbeing. In low-income countries, access to services, health care, and crime rates are highly variable, both between and within countries. In a study of ten countries in sub-Saharan Africa, I also find that urban residents are more likely to report higher levels of subjective wellbeing than rural residents. However, I then incorporate characteristics of the social environment into my model, finding the difference between urban and rural residents is no longer substantial, while structural attributes, such as crime rates,

[1] Strang (2010) defines reference group as "social group or category to which the individual is oriented" (p. 109).

are.

Second, a growing body of evidence from studies of subjective wellbeing confirm that wellbeing is shaped, at least partially, by reference group attributes. Frey and Stutzer (2001) write "there is little doubt that people compare themselves to others and do not use absolute judgments" (p. 412). Yet, the association between wellbeing and one's relative economic position within a network or with respect to a reference group is mixed. In studies from high-income countries and at least one low-income country, comparing oneself to a relatively better-off reference group leads to feelings of lower wellbeing, which is generally termed "relative deprivation" (McBride 2001, Frey and Stutzer 2001, Ferrer-i-Carbonell 2005, Fafchamps and Shilpi 2008). In several low and middle-income countries, comparing oneself to relatively wealthier reference groups leads to increased feelings of wellbeing for at least some of the population, especially poorer individuals, often described as "positive externalities" (Senik 2004, Kingdon and Knight 2007, Ravallion and Lokshin 2010).

Why relative deprivation is found in some instances but not in others, and whether the level of income within a country matters for the findings are both unclear. Unfortunately, the methodological approaches used to estimate reference group effects vary, making comparisons across findings difficult. Further, as Ravallion (2012) notes, both homophily-based and spatially-based reference groups are defined by the analyst, who may not observe what the respondent observes. In Chapter 4, I also examine how reference group construction influences the likelihood of finding evidence of relative deprivation.

Few subjective wellbeing studies that focus on individuals from low- or

middle-income countries incorporate inequality-based measures as predictors of wellbeing (Senik 2004 is an exception). In most studies, an average measure of reference group income, assets, or consumption is included in the estimation of wellbeing, but measures of dispersion of income within the reference group are not. Yet, the dispersion within a reference group may matter. Having referents all slightly financially better off may impact one's own wellbeing differently than having referents who are wildly better off or wildly worse off, but on average slightly better off. Not including dispersion measures, such as Gini coefficients, misses an opportunity to identify whether the underlying degree of inequality within the social environment is related to one's own subjective wellbeing. Chapter examines what types of inequalities, if any, are valuable predictors of subjective wellbeing.

Undertaking wellbeing assessments may provide a snapshot into the effects of policy changes on lives (Andrews and Withey 1976 and Campbell et al. 1976). Campbell et al. (1976) in a study of Americans' satisfaction with life, find the relationship between objective conditions and psychological status to be weak. They write that increasing affluence "has not lifted American society to utopian levels of harmony and personal fulfillment but it has helped raise national aspirations to the attainment of those goals" (Campbell et al. 1976, p. 2). They argue that measures of wellbeing better capture the effects of social change on individuals' assessments of their lives than other measures. In their words, "the relationship between objective conditions and psychological states is very imperfect" (Campbell et al. 1976, p. 4). Diener et al. (2002) points out that SWB gives voice to respondents, which is critical because respondents' own perceptions may differ from external assessments.

Economic measures fail to fully capture perceptions of wellbeing. This finding indicates the need to better understand the influences played by non-economic aspects, such as the social environment, on a respondent's choices and perceptions. Below, I discuss each of the following three chapters before offering concluding remarks.

Chapter 2: Reputation and sharing norms: How peer monitoring influences individual choice in northern Kenya

Research on social norms indicates that the social environment, including the degree of a community's engagement with markets, matters for how people engage with one another (Henrich et al. 2001, Frey and Stutzer 2002, Fafchamps 2011). One the one hand, increasing familiarity with markets and cash-based economies tend to produce more "economically rational" behaviors (Henrich et al. 2001). But, on the other hand, when new norms about economic activities are emerging and old ones are still intact or evolving, people have to pick and choose among conflicting norms, which may result in choices more complex than what might be expected of purely economically rational individuals (Fafchamps 2011). As of yet, there is little information on the sensitivity of social norms to new market-based transfers in less developed countries (Fafchamps 2011). And there is little evidence from field experiments on how the framing of interventions can change the payoffs to abiding or deviating from social norms. In Chapter 2, we manipulate the elicitation strategy to examine how revealed preferences between cash and food are sensitive to differences in peer monitoring. Some social scientists argue that revealed preferences — asking people to make choices with actual payouts — are the most appropriate way to recover

consumers' preferences and therefore utility (Samuelson 1938, Varian 1982). Eliciting revealed preference enables social scientists to observe what people choose when given a real (and not hypothetical) choice. As a result, researchers do not have to rely on best-guesses about what they would choose in hypothetical situations.

By assigning respondents to choose a transfer in front of peers or in private, we identify the degree to which framing changes the relative payoff of being norm-abiding and of being more self-interested. While many respondents choose cash regardless of the elicitation strategy, we find evidence that some respondents' decisions are influenced by the nature of the preference elicitation.

We argue that choosing transfers in front of peers offers an opportunity to build a respondent's reputation whereas choosing transfers in private does not. As a result, respondents making public choices will be more likely to choose food, a good shared within the community, compared to cash. This supports our hypothesis that peer monitoring affects respondents' transfer choices. In other words, for some members of the group assigned to making public choices, being monitored by peers changes the payoffs between transfers. We argue that food becomes more appealing when being monitored because selecting food may garner the respondent some non-monetary benefit, such as the benefit of demonstrating to the community a willingness to choose the more "public" (and more shareable) transfer.

Perhaps surprisingly, neither female household heads nor other female respondents are more likely to either prefer food than male respondents, and as a result no more likely to be norm-abiding. Thus, hypotheses that women prefer one transfer while men prefer another may be over-stated, at least in the instance of northern

Kenyan communities we studied (e.g., Harvey 2007; Ahmed et al. 2009).

Yet, revealed preference approaches are limited. They can only capture actual outcomes. There is no obvious way to apply a revealed preferences approach with subjective or perception-based data, which have no obvious payout. As a result, some researchers avoid perception-based questions altogether, finding data on perceptions about lives or economic status to be nebulous and challenging to interpret (Frey and Stutzer 2002, Senik 2004, Ravallion 2012). Nonetheless, in recent years, there has been an explosion of research on subjective wellbeing—the study of how people feel about their lives (see Diener et al. 2002 for a review). Researchers have used subjective wellbeing to examine relationships between individuals and groups, social capital, and aspirations for success. As Ravallion (2003) notes: "oddly, while [economists] generally think that people are the best judges of their own welfare, they resist asking people directly how they feel." In order to understand how the social environment is incorporated into individuals' perceptions, in Chapters 3 and 4, I turn to measures of subjective wellbeing as well.

Chapter 3: Community Characteristics, Reference Group Inequality and Subjective Wellbeing: Findings from sub-Saharan Africa

In Chapter 3, I examine the influence of institutions and reference group attributes on subjective wellbeing. By so doing, I identify which social structures influence individuals' perceptions about their lives. Much of the research on subjective wellbeing has focused on individual and reference group correlates (see Diener et al. 2002 for a review) or has identified country-specific of pan-regional

cultural differences in understanding what subjective wellbeing means (see Suh and Diener 2000, Uchida et al. 2004 for a review). Yet, the relationships (if any) of environmental attributes at the community level such as access to community services and crime rates have been largely overlooked. This may be because in developed countries, where the vast majority of these studies have occurred, service availability within country is not highly variable. This is not the case in developing countries. In sub-Saharan Africa, the availability of services varies widely, not only across countries but also within countries.

Utilizing crossnational data generated by matching datasets for ten countries in sub-Saharan Africa, I investigate whether, and if so, how structural factors and reference groups within countries shape subjective wellbeing. Specifically, I examine the relationships between wellbeing and structural factors such as crime rates, community health measures, access to services, reference group attributes, and reference group inequality.

This chapter advances our understanding of when and why Africans feel better or worse about their standard of living in two primary ways. First, I find that an index of crime and fear of crime adversely impacts reported wellbeing. On the other hand, self-reported perceptions of government performance in addressing health, food security, poverty and other factors directly related to respondents' lives is strongly associated with improvements in reported wellbeing.

Second, in this study, relative deprivation is an inequality-based phenomenon. When including the more commonly used leave-out mean economic index for broad, spatially defined reference groups, I find no evidence of either relative-deprivation or

positive externalities. As discussed in further detail in Chapter 4, the lack of evidence regarding leave-out mean measures may indicate that spatially-defined reference groups are reference groups of analytical convenience rather than the actual reference groups perceived by respondents. Nonetheless, after substituting reference group dispersion measures and an interaction term for the leave-out mean measures, I find strong evidence of what I term "inequality-based relative deprivation." At low values of the consumption-wealth score, an increase in inequality both decreases the likelihood of reporting higher levels of SWB, and increases the likelihood of reporting lower levels of SWB. In spatial reference groups with lower inequality, a marginal increase in the consumption-wealth index has a smaller (absolute) average effect on SWB than an increase in reference groups with higher inequality. In other words, for those residing in high-inequality areas, a small increase in consumption-wealth index means more to one's wellbeing than for those who reside in areas with lower inequality levels.

Chapter 4: Keeping up with the neighbors?: Revisiting reference groups and their implications for relative deprivation

In Chapter 4, I rely on a slightly narrower definition of subjective wellbeing, focusing on subjective assessments of economic welfare, which are considered to be more stable than broader wellbeing questions (Ravallion 2012). The question I utilize asks individuals to rate their household's economic status relative to other residents in their village. Subjective questions about economic welfare are valuable because they provide one way to ascertain who considers themselves poor, regardless of whether

respondents fall within or outside of standard definitions of absolute poverty (Merton and Kitt 1950, Ravallion and Lokshin 2010, Ravallion 2012). Merton (1938), for example, argues that poverty may be experienced differently based on culture and institutional norms. He writes "poverty has varying social significance in different social structures" (p. 681). By comparing three possible constructions of reference groups, I can examine how, if at all, the relationship between subjective economic wellbeing and reference group changes by type of reference group. In other words, does the likelihood of people identifying themselves as better-off or poor depend on the composition of their reference group?

Unique data from Ghana enable me to estimate a subjective measure of economic welfare as a function of three types of reference groups: spatial, spatial-cohort, and several ego-centric network reference groups. I find that respondents' wellbeing is sensitive to reference group definitions. First, I find that people experience relative deprivation when comparing themselves again asset holdings and expenditures by others in their own village. Second, I find a similar, but weaker effect when respondents compare themselves to people of the same gender and from the same village. Third, and most intriguing, I find that respondents experience higher subjective wellbeing when some social network members spend less and accumulate assets. In particular, these findings hold for social network members the respondent has defined as trusted or the respondent has received a gift from.

I hypothesize that respondents in this sample feel better when their social networks have assets that they can potentially draw on in times of distress – and that respondents don't want their networks spending money that will no longer be

available for them. Thus, I find that individuals' perceptions of their lives are shaped by against whom they are benchmarked. Studies of low-income countries relying on analyst-defined reference groups, such as spatial or spatial-gender groups, may not fully capture how people relate to those individuals more heavily involved in their lives.

Summary

In this dissertation, I foreground the influence of social environments on individuals' decisions and perceptions of their lives. My research advances our sociological understanding of when and why Africans feel better or worse about their standard of living, what role peers play in decision-making, and challenges core assumptions about relative deprivation and subjective wellbeing.

First, in a randomized block experiment, I find that manipulating the social environment by asking people to respond either in public or in private induces framing effects. When asked in public, individuals are more likely to choose a food transfer, but in private, they are more likely to choose an equivalently-valued cash transfer. In northern Kenya, food is more commonly shared among neighbors, kin, and clan than cash. I argue that an environment of peer-monitoring induces respondents to select the more socially optimal choice of food.

Second, while many researchers study subjective wellbeing, to date much of these studies have focused on individual attributes or the economic characteristics of reference groups. In ten countries in sub-Saharan Africa, I find that environmental factors, such as crime and perception of governance, are associated with individuals'

subjective wellbeing and should not be discounted as important factors in assessments of wellbeing. My findings on the importance of the social environment likely extend beyond sub-Saharan Africa to low-income countries more broadly, many of which face similarly variable institutional efficacies and environmental characteristics.

Third, using data from Ghana, I unpack how different constructions of reference groups influence subjective wellbeing. Individuals tend to feel better about their own economic wellbeing when those they trust or those from whom they have received gifts become financially better-off. The same individuals feel worse about their economic wellbeing when other villages or villagers of the same gender become financially better off. In other words, I find that treating differently defined reference groups as equivalent to one another misrepresents the social environment in which people reside. This suggests that we can better understand how reciprocity, mutual insurance, and sharing of risk occurs within a community by understanding the depth of the relationships between individuals.

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CHAPTER 2

DOES PEER MONITORING INFLUENCE INDIVIDUAL CHOICE?: FINDINGS FROM A FIELD EXPERIMENT IN NORTHERN KENYA

Abstract

Does peer monitoring shape economic decisions? We employ a randomized block experiment to study how northern Kenyans' choices of monetarily equivalent cash or food are influenced by asking respondents in front of peers or asking respondents privately. We find that peer monitoring decreases the likelihood of choosing a monetarily equivalent value of cash relative to at least some food. We consider several explanations as to what motivates this behavioral shift. Based on the local context of both chronic food insecurity and tight-knit communities where food transfers are commonly shared but cash transfers are relatively new, we argue that peer monitoring encourages adherence to social norms of sharing food. That is, being monitored provides respondents an opportunity to demonstrate publicly a commitment to local norms or to recall their commitment. These findings point to the importance of framing effects in communities where sharing is a salient social norm and suggest directions for research on decision-making and group behavior.

Introduction

Social scientists have described the extensive role sharing livestock and goods plays within pastoral communities in arid and semi-arid Kenya (Ensminger 1992, Spencer 1997, McPeak 2004). Concerted community actions, such as reciprocal lending for restocking, sending children to live with relatives or friends, and giving

gifts, remain important forms of traditionally practiced mutual insurance, even as these co-insurance practices become less effective in the face of increased climate variability, enclosure of commons, environmental degradation, and other factors making pastoralism an increasingly high-risk livelihood (McPeak 2005, Little et al. 2008, Mude et al. 2009, Chantarat et al. 2012). Whether a community member – and her family – overcomes a difficult shock or a time of might ultimately be based on the relations that she has built in the community and her ability to draw on resources of her social assets (Little et al. 2008). Thus, demonstrating a commitment to one's own community through generalized reciprocity and following local sharing norms may be one component of a portfolio of survival strategies.

One commonly shared good is food, and in particular, food aid, although precise sharing rules vary by tribe (Mude et al. 2012). Food aid merits specific attention because it has been widely distributed in a decade-long response to chronic food insecurity in the region. For at least 25 per cent of the sampled population in Marsabit district, in northern Kenya, food aid comprises a quarter of their total income (McPeak et al. 2009). As of June 2008, approximately 40 percent of the Marsabit population (63,720 individuals) received United Nations World Food Programme food aid, delivered by the Kenyan Red Cross (Mude et al. 2012).

Among donor and recipient governments and aid agencies, there is an increased interest in alternatives to food aid, including delivering cash aid (Upton and Lentz 2011). Under which conditions households prefer different food security transfers, generally cash, food, or some combination, is an ongoing area of research (Harvey 2007, Barrett et al. 2009, Michelson et al. 2012). To examine the sensitivity

of responses to questions about food assistance preferences, we implemented a field experiment examining what type of transfer – cash or food – respondents preferred and whether preferences were shaped by being asked privately or in public.

By asking a random subset of respondents to choose food or cash privately and asking a second subset to reveal their preferences in front of peers, we aim to understand whether peer monitoring changes the relative value of monetarily equivalent cash and food transfers. While many respondents choose cash regardless of the elicitation strategy, we find evidence that peer monitoring almost doubles the proportion of respondents choosing at least some food, from 20 percent to 38 percent.

We consider several interpretations of our findings that in this new, experimental setting peer-monitoring conditions some individuals' responses. Within northern Kenya, there are established sharing norms for food aid. Yet, no such sharing norms appear to be associated with cash transfers, which few respondents have had previous experience with. We argue that those respondents, who choose food in front of peers, may be demonstrating a willingness to follow social norms of food sharing.

The organization of the paper is as follows. First, we briefly discuss the experimental literature and then describe the sampled northern Kenyan communities. We include discussions of the roles of food aid and sharing norms in these communities and the relatively little experience respondents have had with cash transfers. We examine research about sharing norms, reputation, and the role of monitoring in decision-making. We then develop a model wherein respondents' perceptions about payouts vary by elicitation strategy. We present our data and our experimental method. We then present findings using logit models and discuss results.

We conclude with suggestions for future research.

Literature Review

Experimental approaches

Laboratory experiments have found that respondents are susceptible to social framing effects (see Ellingsen et al. (2012) for a review). Framing effects, which present logically equivalent alternatives but either highlight different subsets of information (e.g., the number of lives saved versus the number of lives lost for the same population (Tversky and Kahneman 1981)) or present identical games in different ways (Liberman et al. 2004). For example, renaming the prisoner's dilemma as the "Community Game" or the "Wall Street Game" can induce cooperation or more self-interested behavior (Liberman et al. 2004).

Framing effect studies tend to be laboratory-based, focusing on how sensitive respondents are to changes of wording in the game or the choice. Within field experiment settings, the extent to which choices for actual, and not hypothetical, payouts (i.e., "revealed preferences") are susceptible to framing has not yet received the same scrutiny (Hossain and List (2012) is an exception). Outside of experimental settings, many have argued that social forces, such as sharing norms, shape decisions and regulate behavior (Hechter 1988, Ostrom 1990, Hechter and Dieter-Opp 2001, Heckathorn 2002, Anthony 2005, Fafchamps 2011). Yet, the degree of influence of social norms on choices is difficult to identify. Indeed, it is an open question as to whether such social forces matter in one-off experimental settings that fall outside of normal, day-to-day interactions.

Our field setting enables us to how the surrounding environs influence choices.

Rather than examine the influence of word choices affects decisions, we use a block-randomized experimental design to empirically test whether, and the degree to which, peer monitoring will affect decision making.

Context: Pastoralism, food aid, and food aid sharing in northern Kenya

Marsabit district[2], an arid and semi-arid region of Northern Kenyan, with an estimated population of 160,000, is the second poorest district in the nation (KNBS 2007).[3] In 2007, 82 percent of its population was estimated to be below the $1.25 per day poverty line (Kenya Arid Lands Resource Management Project (ALRMP) II 2008). Throughout the past decade, the district's level of global acute malnutrition has been above the World Health Organization's "critical" threshold (15 percent), indicating emergency levels of food insecurity in Marsabit (Kenya ALRMP II, 2008). Given the duration of high malnutrition rates, food insecurity is also chronic.

Livelihoods in Marsabit have been traditionally livestock based. 75 percent of Marsabit district's residents obtained more than half of their income through pastoral activities (McPeak 2009). While the majority of households continue to engage in some form of pastoralism, pastoralists find it increasingly difficult to maintain their production system. Shocks from multiple sources (e.g., drought, conflict, lack of grazing rights or access to water, human and animal diseases) make pastoralism an increasingly risky livelihood strategy (Mude et al. 2007, Little et al. 2008).

Like most of northern Kenya, Marsabit's food relief operations operate mainly

[2] Marsabit has now been split into three smaller districts, but we refer to the pre-2007 split of Marasbit district because food aid programs continue to be administered based on this larger district and the most recent census was at this larger district level.

[3] The most recent census in Marsabit was 1999. This figure has been adjusted by 32 percent to reflect population increases during the past ten years (Kenya Department of Development Coordination – Office of the President 1999; Ouma et al. 2010).

through continuous General Food Distribution under the United Nations World Food Programme Emergency Operations program. The number of food aid recipients fluctuates depending on food security assessments, although aid deliveries reach most communities for at least part of each year. In June 2008, the most recent data available prior to our April 2009 survey, 40 percent of Marsabit district residents received food aid.

Food aid recipients are identified through a community based targeting approach (Kenyan Food Security Steering Group (KFSSG) 2008a, and KFSSG 2008b). Food aid deliveries occur monthly. Targeted households included on a roster are eligible to receive a food basket comprised of maize, beans, and fortified vegetable oil. A representative of the eligible household waits outdoors, in line to collect the household rations. Distributions are made in public. Generally, rations are offloaded the delivery truck and directly transferred to eligible households. Given the large proportion of the population who regularly receives food aid, there does not appear to be any stigma associated with receipt.

As part of a survey assessing markets and food insecurity undertaken in April 2009 (see Mude et al. (2012)), we purposively selected five communities across Marsabit District by market access, production system and ethnicity: Dirib Gombo, Kargi, Logologo, Loiyangalani and North Horr. A map of Marsabit is presented in Figure 2.1. A brief overview of the community attributes is available in Table 2.1. Researchers in other contexts have argued that group attributes, such as strong group identity, high levels of reciprocity, and the threat of sanctioning, are linked to cooperative outcomes (Ostrom 1990, Heckathorn 2002, Anthony 2005). Marsabit

communities tend to be tight-knit and composed of individuals from the same tribe or allied tribes, who share the same ancestral tribal identity (Schlee 1989, Little et al. 2008).[4]

Little et al. (2008) write that for pastoralists in arid and semi-arid northern Kenya "people (*social assets)* and animals (*material assets)* ... are inherently complementary resources and both need to be managed effectively to avoid being poor" (p. 598). Ensminger (2004) argues that the high degree of sharing observed in many comparatively less market-oriented societies in East Africa is attributable to precise sharing rules and is sustained by considerable monitoring within the community.

Indeed, the tight-knit aspect of Marsabit communities may encourage (or induce) food aid sharing, although different communities share or redistribute differently. Common experience with food aid and with the sharing of food aid is born out in our survey of poor and near-poor households (determined by rankings of animal-asset holdings). Only three of 120 respondents had not received food aid. 64 percent of households receiving food aid admitted to having shared their aid with relatives and neighbors during our survey.

During in-depth focus group discussions (FGD) in Marsabit district, respondents readily acknowledged that their communities considered food - and food aid especially - is a resource to be shared within these pastoralist communities. However, the precise nature of food aid sharing differs across communities.

[4] An exception is the more diverse Marsabit Town, the district capital and major hub of market activity in the district.

Respondents often perceive re-targeting to be discouraged by aid organizations and, in part for this reason, many were reluctant to discuss precise intra-community redistribution practices with aid agencies. As a result, this practice often goes undocumented or under-reported by aid agencies. Similarly, for this reason, it is likely that 64 percent of surveyed people reporting having shared food aid is likely lower than the true figure.

Figure 2.1 here

In Kargi, Rendille informants explained that in their communities food aid must be shared with any neighbor or kin who asks for some. For Rendilles, while sharing is informal, it is expected. Key informants from North Horr, a predominantly Gabra community, explained that following a food aid distribution, recipients are strongly encouraged by community leaders to return a portion of their food aid into a communal pile. Designated community members, usually elders, then re-allocate this food aid to certain households. Members of Dirib Gumbo and Logologo communities, both of which are located near Marsabit town, the base for local aid agencies, acknowledged that food aid was redistributed but were more circumspect about indicating exactly how food aid redistribution occurred. Through more frequent interactions with aid agencies relative to members of other communities, they may be more aware that some agencies frown upon sharing food, and thus could be more reluctant to divulge information that may displease agencies. In Loiyangalani, which is the most ethnically diverse of our sites, with small ethnically similar hamlets, people were similarly reluctant to divulge how food aid was shared.

Table 2.1 here

These northern Kenya cases of sharing food aid within a community are consistent with broader research on social norms. Bowles (2009) argues that "moral sentiments" combined with incentives can induce behaviors beneficial to others and that an individual's long-standing social reputation is not separable from economic incentives. Ostrom (1990) and others have argued that group membership influences individuals' within-group behaviors (see also Heckathorn (2002), and Anthony (2005)). Members of cohesive communities are more likely to follow norms, possibility due to sanctioning of non-norm abiding behavior (Coleman 1990, Horne 2001).

Within most northern Kenyan communities members can lay some claim to food aid transfers and pastoral products. However, cash transfers may not be subject to the same degree or type of sharing norms, even if cash transfers and food transfers have equivalent food security objectives. We do not well understand northern Kenyans' treatment of cash transfers in part because there had been no cash-based programs in operation in our sampled communities, and only one respondent in our experiment had any previous experience with cash transfers.

In FGDs, respondents argued that in their communities, cash received would not need to be shared with others (Ouma et al. 2010). That FGD participants consider cash, regardless of whether a respondent earned it or was provided it as a transfer, to have a different value to the community than food aid is consistent with findings from other Kenyan pastoral communities, within which cash is perceived as a private good

and food aid as a semi-public or public good (Ensminger 2004).[5]

Outside of northern Kenya, Margolies and Hoddinott (2012) and Ahmed et al. (2009)) note that different transfers may be associated with particular obligations, for example, the belief that food transfers "should" be shared with extended family. MacAuslan and Riemenschneider (2011) report that in Zimbabwe, relative to food transfers, cash transfers were associated with a negative impact on intra-community relations; recipient households shared food with non-recipient households but did not share cash. Goldberg (2010), in a randomized field experiment, finds that in Malawi winners of windfall lotteries whose winnings are made public spend their winnings faster than those whose winnings are kept private. The author argues that the rapid spending by publicly announced winners is a means of decreasing the fraction of winnings that must be shared within the winner's social network. Thus, money won in public comes with a public expectation of abidance of sharing norms while privately won money does not (Goldberg 2010).

Beyond any influence of sharing norms on choices, there are several reasons why monetarily-equivalent transfers might be valued differently. Respondents may strongly prefer cash or food due to some other attributes, such as previous experience, or ability to hide it. Research in Malawi found that experience with certain transfers may predispose individuals to prefer those transfers relative to new or different transfers (Devereux et al. 2007). Thus, respondents may be more likely to select food rather than cash, regardless of the framing. In contrast, cash offers greater flexibility

[5] Luke and Munshi (2006) find that many Kenyan urban migrants remit cash to rural kin or rural kin of their spouses. Informal discussions on remittances reveal that pastoralists do not believe that the community has a claim over (the relatively few) remittances received by community members.

and fungibility than food (Harvey 2007, Villa et al. 2011). The greater fungibility of cash could mean that cash is selected, regardless of whether monitoring occurs. Earlier research in and around Marsabit district indicates that despite frequent receipt of food aid, households rank food aid as a low-priority welfare-improvement intervention (McPeak et al. 2009, Mude et al. 2007). Thus, respondents may be willing to try a new form of transfer. Further, food, carried in sacks or bags, is also highly visible to neighbors and kin. Cash, which can be easily hidden, does not automatically signal neighbors, kin, and other community members to the availability of a transfer to be shared.

Thus, it seems likely that community members would not subject cash to the same norms as food. As of yet, there is relatively little information on the sensitivity of social norms to new market-based transfers, such as cash-based transfers, in less developed countries (Fafchamps 2011). When new norms about economic activities are emerging and old ones are still intact or evolving, people have to pick and choose among conflicting norms, which may result in choices more complex than what might be perceived through a lens of pure economically rational individual behavior (Horne 2001, Fafchamps 2011). Understanding the roles of peer monitoring in tight-knit communities in influencing northern Kenyans' transfer choices can offer insight into social framing effects and into the role of reputation in tight-knit communities.

Hypothesis

We are interested in isolating the role of monitoring in choice decisions, hypothesizing that the total value of each transfer differs by a non-monetary factor, reputation. To do so, we ask one group of individuals to choose between equivalent

values of cash and food in front of a peer group and another group to choose in private. We test whether monitoring induces a change in choice from at least some food toward cash. We hypothesize that an individual may prefer one outcome (cash) in private but choose another (food) in public. We develop a model that incorporates a reputation-effect, which changes the relative value of different forms of monetarily-equivalent transfers depending on whether an individual is monitored or not.

Several mechanisms that explain such a shift are consistent with our hypothesis that monitoring changes the relative values of cash and food aid. Choosing in public a transfer that can be shared signals a willingness to abide by sharing norms and potentially enhances exchange relations. A respondent may choose food that can be shared within the community in order to "get credit" from her peers as a person who follows social norms. Relatedly, peer monitoring could discourage individuals from deviating from the outcome desired by the community as a whole. Peer monitoring, then, acts as a form of social control exerted by community members on individuals and rather than face sanctioning, respondents may choose to follow norms (Horne 2001). Third, the very presence of community members during a decision acts as a visual reminder (or framing effect on) of the need to follow established food sharing-norms in their community. All of these interpretations may coexist within a community and may be salient different members.

Alternatively, if monitored and non-monitored groups choose approximately equivalent ratios of cash to food, we would know that peer monitoring, at least in a field experiment context, did not encourage differential adherence to sharing norms.

Data, experimental design, and model

In our 2009 survey on market access in food insecure areas, we purposively selected Dirib Gombo, Kargi, Logologo, Loiyangalani and North Horr by market access, production system and ethnicity (Table 2.1 and Mude et al. 2012). We then randomly sampled households from lists of middle and low wealth classes. These asset-poor households are most likely to be in need of food security responses and most likely to be targeted for future aid transfers. In four communities, a previous survey team had established a complete wealth-ranking (high, medium, low) of households by herd size within each community (Chantarat et al. 2012). In Loiyangalani, where a comprehensive household wealth-ranking was unavailable, we randomly sampled households from a list of food relief recipients collected at food distribution points operated by the Kenya Red Cross using World Food Programme funds and aid.

Approximately 40 respondents were sampled from each sub-district, including those living in outlying communities, some of whom lived in satellite camps as far away as 30 kilometers from the sub-district's main markets. Respondents first participated in a household survey and then were invited to participate in one of two FGDs that included other sampled respondents from the community. The experiment was a component of this second stage of the survey. Before each of the focus group discussions, we randomly assigned six to seven respondents to one of three treatment groups. Within these treatment groups, preferences were elicited.

At the start of the household survey, we told respondents that they would receive a token of appreciation worth 200 Ksh for their participation in both the household survey and the later focus group discussion and that they would receive the

token at the FGD.[6] The household survey, limited to the household head, a spouse, or suitably competent adult member of the household, included questions on household demographics, income and assets, market access, food aid experience, and preferences over various forms of assistance.

Three to six weeks later, the two FGDs were convened in each sub-district's main market town. Once participants had arrived for their FGD session, the enumerator team directed participants to their randomly assigned treatment group. In treatment group one, individuals revealed their preferences privately, one at a time, to a FGD facilitator who was far removed from other participants. In treatment group two, individuals were asked to reveal their preferences in front of their treatment group (i.e., in front of six or so other members of their community). In treatment group three, individuals were told they must reach consensus on a single transfer, which will be received by everyone in the group.[7]

Prior to asking respondents for their preferences, enumerators told each treatment group that they would be asked to choose their preferred form of the token of appreciation: 200 Kenyan Shillings (Ksh) worth of maize, the dominant staple grain, valued at local market prices on the day of each FGD, 200Ksh in cash, or a 50 percent-50 percent mixture of each and that the choice was binding. We selected

[6] A payment of 200 Kenyan shillings is slightly more than the then current rate for day-labor. We considered it a fair value for respondents' opportunity costs, given that each respondent had to complete both the interview and attend the focus group discussion, which occurred in the sub-district market center and for some households was a substantial distance away from their homes.

[7] In the broader study, we elicited preferences from three groups: a group who revealed their preferences privately, a group who revealed their preferences in front of one another, and a group who came to a consensus about which transfer the entire group preferred. We do not include consensus group responses because we are interested in comparing choices between respondents revealing privately and respondents revealing in front of a group of their peers. This reduces our sample size to 120.

maize to represent "food" because all households in our sample reported consuming at least some maize and because maize comprises the bulk of food aid deliveries to the area. The transfers were shown to each group. See Appendix 1 for phrasing of the preference elicitation question. After everyone had made a transfer choice, the three treatment groups reconvened for a joint focus group discussion. Transfers were distributed at the end of the FGD session.

To address community heterogeneity, potentially resulting from differences in dominant ethnicity, market access, sharing norms, or other unobservable factors in the five communities that may influence respondents' choices, we employ a randomized block design. This design allows us to examine the effect of monitoring on populations within each community (or "block"). We ran the experiment twice in each of our five blocks. Ten groups of six to seven individuals chose their preferences privately and ten groups chose publicly.

Due to the small number of respondents who selected a food-only transfer, we combine food and mixture categories into one category, reflecting a choice of at least some food. Our dependent variable then becomes a binary choice, with the base category being at least some food. In our model, respondent i from community j chooses the transfer, y_{ij}, that will maximize his or her underlying joint income and reputation payoff. We model respondents selecting the transfer that maximizes their total payoff, which is some combination of monetary value and reputation value, subject to whether they are being monitored or not.

Some economists argue that fungiblity of cash makes it more appealing relative to other transfer forms (Villa et al. 2011). For this reason, cash may be

preferred in private, where there is less opportunity to publicly signal abidance with sharing norms. In contrast, monitored respondents may choose at least some food to signal a willingness to share food with other community members. In our model, we expect respondents are more likely to choose food when monitored because selecting food provides higher reputation gains for respondents that may outweigh any gains from the fungibility of cash:

$$
\begin{aligned}
&y_{ij} = f(w_{ij}, v_j, \vec{x}, \varepsilon_{ij}) \\
&y_{ij} \in \left(At\ least\ some\ food = 0, Cash = 1\right) \\
&w_{ij} = Treatment : monitoring = 1 \\
&v_j = Effect\ of\ block\ j \\
&\vec{x} = Vector\ of\ attributes \\
&\varepsilon_{ij} = Experimental\ error
\end{aligned}
\tag{1}
$$

The monitoring treatment, w_{ij}, equals one for those revealing publicly in front of peers (i.e., being monitored) and zero for those privately revealing. The coefficient on w_{ij} reflects the marginal influence of reputational gains or losses on the probability of choosing when making a choice in the peer-monitoring group relative to making a private decision, holding community attributes constant.[8] We expect that the monitoring by community members in the public group will shift respondents' preferences away from cash only and toward at least some food.

We include community-level indicators, v_j, to capture variation across the five blocks due to unobservable community characteristics (Brown and Melamed 1990). Because the focus of the experiment is on the role that monitoring can play in people's choices, we include community fixed effects to control for any community-specific

[8] The reputation effect could also occur through a contagion process, whereby the first revealer (chosen at random) establishes the choice from which to deviate.

factors that may also influence choices. Failing to adjust for these characteristics could introduce experimental error.

In Model 2, to account for any imbalance in possible consequential covariates across the randomization, we incorporate a vector of adjustment variables, x, that may be related by chance with treatment assignment. This vector, x, includes household demographic and income characteristics, such as frequency of food taken on credit (0=less than weekly), per capita total cash expenditures in the past two weeks (in 1000s of Kenyan shillings (Ksh) per capita), estimated marginal propensity to consume food (elicited through a proportional piling exercise during which respondents indicated the proportion of an increase in income that would spent on food)[9], per capita annual cash income (in 1000s of Ksh per capita), walking distance from their house to their community's central market (in minutes), household size (number of persons), and maximum number of years of schooling attained within the household. The following indicator variables were also included: past receipt of food aid (0=no experience), past experience sharing food aid (0=never shared), and respondent gender and household head status (0=male, 1 = female non-head, 2= female household head).

We expect that individuals living in households that access credit for food every week, are relatively close to a central market, have shared food aid, and have low marginal propensities to consume food, are more likely to need cash and therefore may indicate a preference for cash. Female respondents may prefer food relative to men because of food's relative lack of fungibility, making it easier for women to

[9] Mude et al. (2012) provides details on generating marginal propensities to consume food.

control the transfer (Ahmed et al. 2009). Larger households may have a greater need for a large quantity of maize (the food transferred) than smaller households. Respondents with high per capita cash income and high food expenditures are more familiar with using cash and therefore may prefer cash. By incorporating these factors in Model 2, we can better account for transfer responses in the event that other determinants are imbalanced across the different treatment groups.

Results

We present descriptive statistics in Table 2.2. 204 people participated in at least either a FGD or a household survey. Of these 204 respondents, two respondents did not participate in the initial survey but were included in the FGD. Thirteen households were missing answers to basic questions about the gender of the respondent or the household head, time to market, aid preferences, education, and shared food in addition to key types of information. All fifteen respondents were excluded from our estimations.

Of the remaining 189 households, 11 did not attend the focus group discussion. To test for the non-randomness of attrition for those 11 individuals, we used a logit model to determine the likelihood that characteristics of attritors statistically significantly differed from those of non-attritors. The attrition results suggest that cash-poor individuals and more educated individuals are more likely to attend the focus group discussion. This is in keeping with normal attrition, where both the poorer and better-off are more likely to participate in longitudinal surveys. We removed attritors from the sample, decreasing the sample to 178, which includes only respondents who answered both the survey and attended the FGD (See Appendix 2 for

results). Results from treatment three are not presented here. This reduces our sample size from 178 to 120.

Nearly 80 percent of respondents were women (95 of 120), reflecting the fact that most adult males were pasturing their animals, sometimes in base-camps that were a several days walk away from settlements. The sample includes female household heads (n=46) and females who are not household heads (n=49). The remaining respondents were males, who were all also household heads (n=25). The average time required to reach each community's central market by foot was 84 minutes.

Table 2.2 here

The majority of respondents had some familiarity with food aid and, given that all respondents were sampled from low and middle asset classes, are likely to be targeted in future food assistance programs. In our sample, only three households out of 120 did not report receiving food aid within the last year. 77 of 120 (64 percent) respondents shared or sold some of their food aid. Only one respondent reported experience with cash transfers. Of those individuals privately revealing their preferences, nearly 80 percent chose cash, less than two percent chose food, and the remainder chose a mix. Of those facing peer monitoring, 62 percent chose cash, nearly five percent chose food, and the remainder chose a mix. As described above, we combined food and mixture categories in the following models to reflect respondents' preferences for at least some food compared to all cash.[10]

We present results for two models in Table 2.3. Model 1, includes our variable of interest, choosing transfer publicly. Coded as an indicator variable, privately

[10] There was not enough variation in responses to estimate a three-category multinomial logistic model.

revealing preferences is the reference category. Model 1 also includes community indicators, to adjust for any effects due to site-level nuisance factors. In Model 2, we introduce individual-level and household-level variables that could account for any variation in responses found in Model 1. We present results from both models using robust standard errors to correct for any heteroskedasticity and intragroup correlation. Given that the sampled communities are tight-knit and relatively small, it is likely that our observations are correlated within communities. Robust standard errors are most suitable for asymptotically large samples and our sample is small. However, we report robust errors, which are larger than conventional standard errors, because they are more cautious.

Table 2.3 here

In Model 1, we examine the effect of being assigned to the two groups. We find that being assigned to the peer monitoring group decreases the predicted probability of choosing cash from 80.2 percent to 61.4 percent, with standard errors of 0.058 and 0.052 respectively. In other words, being monitored decreases the likelihood of choosing cash by 23 percent. This difference is statistically significant at conventional levels.

With the exception of Dirib Gombo, community-level fixed effects do not play a role in preference choices. Residing in North Horr (our control community) instead of in Dirib Gombo increases the odds of choosing cash compared to at least some food by more than 3.5 times. Dirib Gombo residents are near the main (unpaved) highway in Marsabit district, would seem to indicate easier access to markets, which would enable spending of cash. Upon further investigation, we found that the highway is a

major flash point for banditry and conflict. Thus, Dirib Gombo residents may prefer food, which does not require venturing onto the road during periods of insecurity. Therefore, other important macro-level effects, in addition to peer monitoring and individual's own desires, influence people's choice of transfer.

In Model 2, we assess whether our findings in Model 1 are produced by an imbalance in possible consequential covariates across the randomization. Incorporating covariates into Model 2 allows us to establish whether the role of monitoring remains a significant factor in respondents' transfer choices. Therefore, we include household and respondent characteristics, including gender, household head gender, schooling, marginal propensity to consume food, per capita food expenditures, income per capita, experience with credit for food, experience sharing food, and distance to local market.[11]

A Wald chi-square test for the additional variables indicates that they are not jointly statistically different from zero. In Model 2, being monitored by a group of peers is the only statistically significant variable (at the five percent level). Similar to Model 1, we find that 62 percent of respondents who are monitored are predicted to choose cash. Among those selecting transfers in private, 80 percent are predicted to choose cash, all else equal.

Community characteristics are not strongly associated with preference choice,

[11] We first estimated a complete model, which includes all variables listed in the descriptive statistics: individual characteristics, household characteristics, community characteristics, and household experiences with assistance. We find high variance inflation factors for receipt of food aid, household size, and age of household head. After removing each collinear variable sequentially, the variance inflation factor for each remaining variable is below seven. The results of this series of estimations are in Appendix Table 3.

all else held constant. The effect of living in Dirib Gumbo, which was significant in Model 1, is no longer as large. This suggests that while key informants suggested that sharing norms differed across communities, when we more carefully control for household characteristics, the influence of community-specific unobservables on revealed preferences is reduced.

We also find that common socio-economic indicators poorly predict individuals' revealed preferences. Per capita annual cash income, per capita food expenditures in the past week, and distance to market are not statistically significantly associated with a preference for either cash or for at least some food. Therefore, regular contact with cash, as measured through high levels of income and buying food, and easy access to markets does not appear to significantly drive preference choices in our sample. Experiences with sharing food aid and with regularly needing credit are negatively associated with preference for cash but these estimates are very imprecise. Taking food on credit weekly lowers the odds ratio of choosing cash relative to food but is not significant. Regularly buying food on credit regularly may be a proxy for extreme hardship and households needing credit may be concerned that cash would go to repaying debts rather than for immediate consumption. Sharing food aid is also associated with lowering the odds of choosing cash relative to food but is not significant. The households who share may value the ability to share food with kin and neighbors more than non-sharing households.

Respondent gender and household head status and household demographic characteristics also are not strongly associated with preference choice. While Ahmed et al. (2009) find in Bangladesh that female-headed households preferred cash, but

female non-heads of household preferred food, we do not find a difference by gender or household status. Choices between tokens of appreciation are not statistically related to whether a respondent is female and the household head or female and not the household head, when holding other characteristics constant. All else equal, women who are not household heads are 2.1 times more likely to choose cash relative to food than male household heads, although this result is not statistically different from zero. Therefore, commonly-held beliefs that women prefer less fungible food aid while men prefer greater fungibility with cash may not be true for our experimental intervention (see also Harvey 2007).

Discussion: monitoring and reputation

In our randomized block field experiment in northern Kenya, we find respondents' decisions between cash and at least some food are influenced by peer monitoring. In Model 2, about 20 percent of those selecting a token of appreciation in private prefer at least some food while that share nearly doubles to 38 percent among those who are monitored by peers while choosing.

We turn now to *why* this is the case. Food transfers may become more appealing to some respondents when being monitored for several possible reasons. In our model, selecting food garners the respondent a non-monetary benefit. In other words, for some members of the group assigned to making public choices, being monitored by peers changes the payoffs between transfers. Candidate explanations for this change in valuation is that being monitored increases the value of choosing at least some food relative to cash through a "reputation effect." Being monitored creates the opportunity to build reputation as an abider of local food sharing norms or reminds

individuals to participate in them. Sharing food and food aid is a common occurrence in northern Kenya, but similar practices have not (yet) emerged around cash and cash transfers. That is, non-monetary payoff of being seen as willing to abide by local sharing norms is a meaningful component of the total value of each transfer.

Fafchamps (2011) argues that as societies have become more engaged with cash economies, social norms of sharing are changing as well. In a dynamic social environment, local norms are also dynamic and fluid (Fafchamps 2011). We did not find evidence that the willingness to follow sharing norms is related to gender or household head status, to household economic characteristics, or to community attributes. However, our models may have failed to capture how engaged with cash economies different respondents are. Respondents in our experiment may be facing competing and emergent social norms and may be facing norms evolving at different rates. Thus, in an environment where cash is becoming newly commonplace, deviating from a sharing norm for food may no longer be subject to previous likelihood or degree of sanctioning. The unobservable nature of exposure to new norms could be contributing to an imbalance in our sample, which could be driving the differential in responses by group.

Another explanation as to why people chose food in public was that they perceived that to be the "right" choice to make in front of the enumerators. The enumerators, during the household survey, differentiated themselves as members of a research team rather than members of an aid agency or government organization. Regardless, respondents may have been wary of the experiment. It is possible that those who were monitored by peers thought that the enumerators were monitoring

their behavior within the group. Given everyone's experience with food, these respondents may have thought that at least some food was the answered desired by enumerators. Based on our field-experience and the extensive training received by enumerators, particularly for the experimental component and we suspect that this was not the case (see Ouma et al. 2010). However, we know of no way to rule out this explanation.

Also, while we find that peer monitoring does influence choices, the majority of respondents assigned to make a choice in public deviated from our expected sharing norms. Regardless of the treatment, many respondents chose cash, which seems to indicate that the food sharing norm is not binding for these respondents in this situation. We consider possible explanations for why people deviated from the sharing norm. First, while respondents were in ethnically-similar peer groups, these groups may not have included members of their immediate, even smaller social network. As a result, respondents may not have felt that sharing norms do not apply to the broader community but rather to a more localized, subset. We are inclined to rule this explanation out as unlikely, at least for the Gabra residing in North Horr, whose food sharing is managed and coordinated by local leaders.

Second, the experiment was a one-off gift of a token of appreciation in a unique setting. In our field experiment, 62 to 80 percent chose cash tokens of appreciation rather than food. However, in our 2009 household survey of 201 poor and near poor respondents across five communities, most respondents (80 percent) preferred at least some food aid when we asked respondents whether they would like to receive an equivalent value of food aid, cash aid or a mixture, distributed for the

same duration, frequency, and distribution currently in place (Mude et al. 2012).

Some respondents may have felt that norms that apply to food aid did not apply to this experimental situation. Zelizer (1994), Villa et al. (2010), and others argue that the source of income affects how that income is used (see also Duflo and Udry 2004, Fafchamps et al. 2011). Zelizer finds that earmarking designates certain types of income (e.g., gifts) for the purchase of certain types of items (such as on durable goods or leisure but not on groceries or debt). In our case, transfers intended to shore-up family food security may be treated differently than one-off distributions of tokens of appreciations. Mental accounting, wherein individuals assign certain income streams to cover certain expenditure activities, can also explain why income across different sources is not as fungible as economic theory would predict (Villa et al. 2010). Thus, the source and duration of different transfers (a token or a regularly food security transfer) may influence whether those transfers are subject to the same norms.

Bowles (2009), in contrast, argues experiments can have had longer-term signaling impacts by demonstrating whether a respondent abides by or deviates from expected sharing norms. Furthermore, a mental-accounting or earmarking explanation does not explain why the likelihood to choose cash significantly drops when a respondent is monitored by peers, suggesting that, for some respondents, commonly held norms did apply in the experimental situation.

Conclusion

We find that monetarily equivalent transfers are valued differently depending on whether the choice between transfers is made in public or private. In other words, the very presence of community-members at a moment of decision-making is enough

to change the relative worth of different transfers. In our experiment, while the majority of respondents prefer cash, peer monitoring induces over 20 percent of respondents to choose food.

We argue that relative to decisions taken in private, decisions made in public provide an opportunity to enhance or maintain one's reputation as willing to abide local, established food sharing norms. Such a choice may build or sustain reputation or social standing, relative to cash that can be easily hidden from neighbors and kin. Choosing privately may mute feelings of obligation to the community or may not afford the reputational benefits derived from choosing food. Thus, the social environment acts as a direct influence on the likelihood of following established social norms of sharing.

Our finding of a monitoring-effect may be particularly strong in northern Kenya. First, the size of populations in each community is relatively small, and it is likely that some peer-monitoring group members know each other, have heard of each other, or are distantly related. The lack of perfect anonymity may mean that the choices in this field experiment are not one-shot decisions but are part of longer-term relationships and decisions may reflect the recognition of respondents that they will likely have future interactions with some participants in the public group. Whether people choose food to "get credit" with their peers or to avoid social sanctioning later is an interesting avenue for future research.

Second, at the time of this experiment, seasonal rains had not arrived and were expected to fail, increasing the likelihood that a severe drought would occur. Indeed, in the following months, this is precisely what did happen, resulting in food security

experts' calls for assistance (IRIN Kenya 2009). During difficult times, respondents may have a heightened sense of obligation to their community or may have a heightened desire to build their reputations as community-spirited. Expecting deteriorating food security in the coming months, respondents may have been more likely to choose food to demonstrate their commitment to their community, hoping that community members would be more likely to share food with them during the crisis. Conversely, those who deviated from the expected norm of sharing may be signaling a desire for independence from their community. Nonetheless, given the large number of monitored respondents who chose a cash token of appreciation, the social norms of food sharing do not appear to binding in the experimental context, indicating that our findings could underestimate the importance of norm-abidance when preferences for food security transfers are elicited.

In our study, respondents make choices based on whether anyone is watching them answer, arguably reflecting the expectations of the observers. This concurs with other experimental findings that changes in the situation can influence behavior in important ways (Ellingsen et al. 2012, Hossain and List 2012). Future researchers and others relying on revealed preference elicitation could benefit from considering the influence of the research conditions (e.g., public discussions versus private discussions or focus groups reaching consensus versus undertaking a private vote) on revealed preferences and choose the framing that best meets their research goals. The difference in framing could be particularly important in approaches to understanding marginalized community members' voices, who may feel more compelled to provide the norm-abiding response in public than in private.

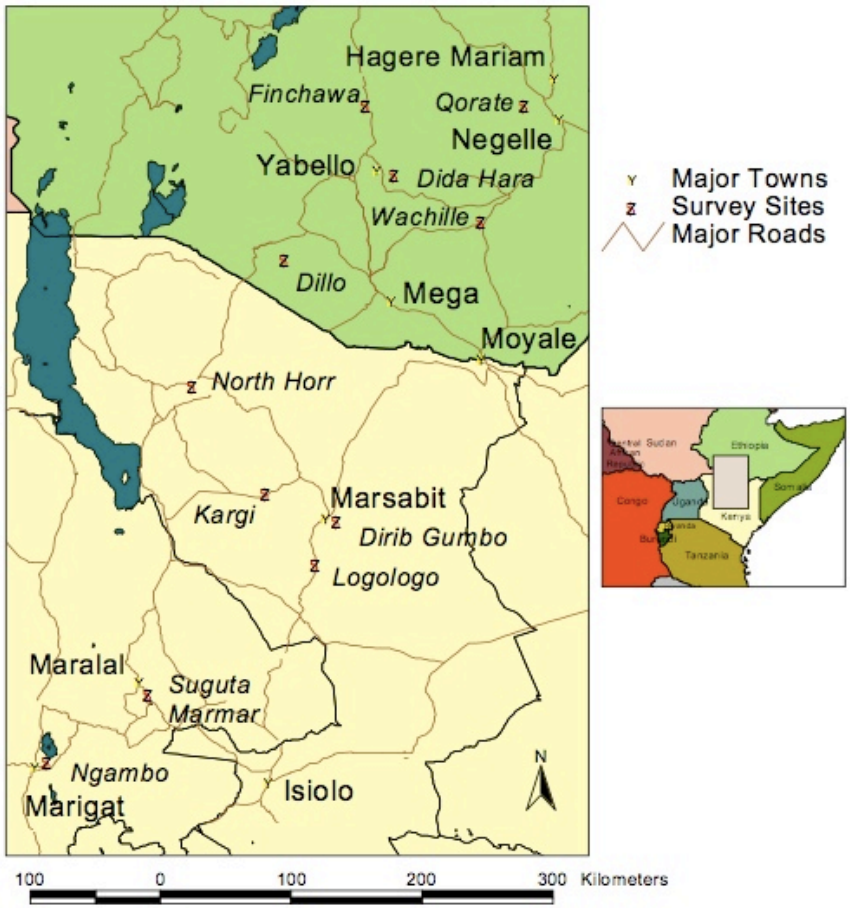

Figure 2.1: Map of Marsabit district and surrounding area

Table 2.1: Characteristics of Sampled Communities

Site Name	Ethnic Majority	Market Access	Agricultural/ Pastoral potential	Annual Rainfall (mm)
Dirib Gombo	Boran	Medium	Agro-pastoral	392
Kargi	Rendille	Low	Pastoral	240
Loiyangalani	El Molo and Turkana	Medium	Fishing and Pastoral	238
Logologo	Ariaal	Medium	Pastoral	326
North Horr	Gabra	Low	Pastoral	237

Data source: IBLI survey codebook (Chantarat et al. 2009) with the exception of Loiyangalani annual rainfall collected from Loy Airport, Loiyangalani Kenya (http://www.worldweatheronline.com/weather-averages.aspx?q=LOY. Accessed September 12, 2011)

Table 2.2: Descriptive Statistics

	Privately revealed preferences (n=59)		Publicly revealed preferences (n=61)		Total (n=120)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Respondent is female = 1	0.83	0.38	0.75	0.43	0.79	0.41
Household head is female = 1	0.44	0.50	0.33	0.47	0.38	0.49
Respondent is male household head	0.17	0.38	0.25	0.43	0.21	0.41
Respondent is female non head	0.39	0.49	0.43	0.50	0.41	0.49
Respondent is female household head	0.44	0.50	0.33	0.47	0.38	0.49
Household head age	48.05	14.28	48.67	14.82	48.37	14.50
Household size	5.69	2.34	6.49	2.47	6.1	2.43
Maximum number of years of schooling in household	5.05	4.79	5.77	4.87	5.42	4.82
Marginal propensity to consume food	0.49	0.14	0.49	0.17	0.49	0.15
Per capita food expenditure in past two weeks in 1000s of shillings	0.36	0.25	0.36	0.23	0.36	0.24
Per capita annual cash income in 1000s of shillings	42.88	66.13	45.71	66.85	44.32	66.23
Take food on credit at least weekly = 1	0.54	0.50	0.61	0.49	0.58	0.50
Received food aid = 1	0.98	0.13	0.97	0.18	0.98	0.16
Shared food aid = 1	0.64	0.48	0.64	0.49	0.64	0.48
Number of minutes to main market used by household	58.00	71.04	109.00	370.49	83.93	268.93

Table 2.3: Logistic Estimations of Cash Chosen Relative to At Least Some Food

	Model 1		Model 2	
	Coef. and Robust Std Errors	Odds Ratio	Coef. and Robust Std Errors	Odds Ratio
Treatment				
Publicly reveal preferences = 1	-1.013**	0.363**	-1.007**	0.365**
	(0.455)		(0.478)	
Individual characteristics^				
Respondent is female non household head			0.742	2.100
			(0.657)	
Respondent is female household head			0.014	1.015
			(0.583)	
Household characteristics				
Maximum number of years of schooling in hh			-0.031	0.970
			(0.051)	
Marginal propensity to consume food			-0.303	0.739
			(1.684)	
Per capita food expenditure in past two weeks in 1000s of shillings			1.053	2.866
			(0.888)	
Per capita annual cash income in 1000s of shillings			-0.000	1.000
			(0.003)	
Take food on credit at least weekly = 1			-0.065	0.937
			(0.432)	
Shared food aid = 1			-0.106	0.900
			(0.576)	
Number of minutes to main market used by hh			0.000	1.000
			(0.001)	
Community fixed effects				
Dirib Gombo	-1.267**	0.281**	-0.946	0.388
	(0.632)		(0.630)	
Kargi	0.285	1.330	0.545	1.724
	(0.762)		(0.844)	
Logologo	-0.784	0.457	-0.301	0.740
	(0.691)		(0.737)	
Loyangalani	0.087	1.091	0.265	1.303
	(0.700)		(0.738)	
Constant	1.838***		1.362	
	(0.555)		(1.263)	
R-squared	0.089		0.112	
Wald chi^2	11.59** (5)		14.48 (14)	
Mean predicted probability of choosing cash	0.708		0.708	
	(0.039)		(0.038)	
Predicted probability of choosing cash for those being monitored	0.614		0.617	
	(0.058)		(0.059)	
Predicted probability of choosing cash for those not being monitored	0.802		0.800	
	(0.052)		(0.052)	

Note: *, **, and *** indicates significance at the 10%, 5% and 1% levels, respectively.
^ Excluded category is male heads of households.

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APPENDIX 2.1
SCRIPT USED TO ELICIT PREFERENCES

Structure of Discussion:

It is important to follow the "script" for revealed preferences in order to maintain comparability across sites.

Once all 20 participants have arrived, welcome them and thank them for their time.

Thank you all very much for coming and for once again giving your time to participate in our research. Today we would like to continue the discussion we began with you individually several weeks ago when one of our colleagues visited you in your homes. We shall take no more than 3 hours of your time to discuss collectively issues of market access, supply availability, and issues related to food aid and the provision of assistance to this community during times of food insecurity.

As you are aware we are researchers conducting a project for the International Livestock Research Institute. We would like to stress that the information we gather is strictly for research purposes. We are not associated with any NGO or Government program providing food aid or any other assistance. We are simply trying to understand how the markets in the area work, how you are able to access food, and how well food aid has worked. We expect to use the findings of our research to inform NGO and government agencies offering relief and development services in this area and hope that our findings can improve food security programs. However, we cannot guarantee that our findings will have any impact because we work for a research institution that does not implement

programs.

Before we go on to the main discussion, we would like to offer you a small token of appreciation for the time you have given to us. You all should have the IOU, "I owe you", that we gave you following the household study. The IOU states that we shall give you either Ksh 200 in cash, its equivalent value in maize, or a mix of Ksh 100 in cash and Ksh 100 of maize. We shall give you this token at the end of this session. However, we would like to determine now which of these options you will receive.

To make this process efficient, we would like to split you into three groups. We have randomly selected these groups in advance.

REVEALING PREFERENCES OVER GIFT:

At this point the facilitators will then call out the randomly selected names and ask the relevant participants to gather in their respective groups. There will be 3 groups each of which will be asked to reveal their preferences in a different decision making setting as follows:

1. Group 1_Private Revelation: 6 individuals will be randomly selected for this group. The instruction will be presented to them as a group then they will each privately

state their preference. Enumerators will not show any individual what others have chosen.

2. Group 2_Individual Revelation Publically: 7 individuals will be randomly selected for this group. They will be instructed that they will each individually, in a sequence that will be randomly determined, reveal their own preference amongst the group.
3. Group 3_Consensus Revelation: 7 individuals will be randomly selected for this group. They will be instructed that they must, as a group, come to a consensus on what package they are to receive. They will all receive the same package.

The instructions:

Ask Groups 2 and 3 to wait in an area separate from where the discussion with Group 1 will occur.

Group 1: *Once again we thank you for your initial cooperation and participation in our survey. To show our appreciation for the time you took responding to our household survey and for the time you are spending with us today we will offer you one of the following (*Show the equivalent values to the group):

a) *Ksh 200 in cash*

b) *Maize worth Kshs 200*

c) *Ksh 100 in cash plus maize worth Ksh 200.*

Each of you will come up to me one by one and let me know what your preference

is. Your choice will not be known to anyone.

Facilitator: Record preferences in provided form.

Group 2; *Once again we thank you for your initial cooperation and participation in our survey. To show our appreciation for the time you took responding to our household survey and for the time you are spending with us today we will offer you one of the following (*Show the equivalent values to the group):

a) *Ksh 200 in cash*
b) *Maize worth Kshs 200*
c) *Ksh 100 in cash plus maize worth Ksh 200.*

I will ask each of you to state your preference. You each will receive what you prefer. The order in which you will state your preference has been chosen randomly.

Facilitator: Follow the list and ensure that the sequence of preferences revealed is per the generated list. Record preferences in provided form.

Group 3: *Once again we thank you for your initial cooperation and participation in our survey. To show our appreciation for the time you took responding to our household survey and for the time you are spending with us today we will offer you one of the following (*Show the equivalent values to the group):

a) *Ksh 200 in cash*

b) *Maize worth Kshs 200*

c) *Ksh 100 in cash plus maize worth Ksh 200.*

Everyone in this group will receive the same package. We would like you to decide among yourselves, which package you would like to receive.

Facilitator: Make note of the discussion dynamics as follows: Do not intervene in the group discussion (unless there is a clarifying question). Listen to how the decision is being made.

APPENDIX 2.2

ATTRITION

A2.1: Sample Attributes

Activity	Number of respondents
Initial household survey sample	n=204
Incomplete interviews or attended preference elicitation at FGD but not the initial interview	n=15
Attrition	n=11
Retained household survey sample	n=178
Preference elicitation at FGD	Total: n = 178 • Public n= 61 • Private n=59 • Consensus n=58
Private and public revealed preferences	Sample size for estimation: n=120

Below, in Appendix Table 2, is a logit estimation of the likelihood of attending the focus group discussion where preferences were elicited, given that the respondent completed the initial survey. All survey respondents from Kargi (n=39) attended the focus group discussion. Therefore, they were excluded from the attrition estimate. Eleven individuals did not attend the second meeting.

A2.2: Attrition

	Attrition (Model 1)	VIF (Model 2)	Attrition (Model 3)	VIF (Model 3)
Respondent gender	0.57	6.15	0.4	5.82
	(1.0412)		(0.9993)	
Household head gender	1.11	2.75	1.18	2.72
	(1.0613)		(1.0362)	
Household head age	-0.01	13.54		-
	(0.0272)			
Maximum number of years of schooling in household	0.24**	3.49	0.23**	3.48
	(0.1043)		(0.0991)	
Number of minutes to main market used by household	0	1.8	0	1.74
	(0.0064)		(0.0064)	

Marginal propensity to consume food	-0.31	10.42	-0.8	8.17
	(2.2659)		(2.1894)	
Household size	0	9.99	-0.03	8.17
	(0.1857)		(0.18)	
Per capita food expenditure in past two weeks in 1000s of shillings	-0.73	3.57	-0.95	3.06
	(1.4979)		(1.4678)	
Per capita annual cash income in 1000s of shillings	0	2.05	0	1.9
	(0.0073)		(0.0072)	
Take food on credit at least weekly = 1	1.76**	2.49	1.81**	2.42
	(0.8253)		(0.8106)	
Received food aid = 1	1.17	20.31		-
	(1.4242)			
Shared food aid = 1	0.39	4.44	0.46	4.22
	(0.8702)		(0.8544)	
Dirib Gombo	1.25	2.45	1.5	2.28
	(1.4491)		(1.4071)	
Logologo	-1.37	2.82	-1.23	2.75
	(1.1939)		(1.1636)	
Loyangalani	-0.16	2.45	-0.09	2.26
	(1.0421)		(1.0139)	
Kargi				
Constant	-0.75		0.52	
	(3.2318)		(2.5737)	
R-squared	0.2045		0.1958	

"*" indicates significance at the 10% level
"**" indicates significance at the 5% level
"***" indicates significance at the 1% level

High variance inflation factors indicate collinearity in our first model of attrition, which employs the same variables used in model one to explain preference choice. Sequentially removing receipt of food aid and household head's age, (model 2 with just receipt of food aid removed is available upon request), we then estimate model 3. All else constant, each year of education a household receive is slightly associated with increases the probability of attending the focus group. Similarly, all

else equal, moving from taking food on credit less than weekly to taking food on credit more frequently is associated with an increase in the likelihood of attending the focus group. These results are sensible. Those requiring food on credit on a weekly basis travel to market regularly (at least weekly) and can therefore attend such a focus group discussion with less inconvenience. Those individuals from more highly educated households may also slightly more frequently attend market centers, as households with more education are more likely to hold jobs in towns and market centers.

These results suggest that cash-poor individuals and more educated individuals are more likely to attend the focus group discussion. This is in keeping with normal attrition, where both the poorer and better-off are more likely to participate in longitudinal surveys. The attritors are removed from the sample.

The full model estimate of the drivers of preferences for cash relative to at least some food is highly collinear. Computing variance inflation factors for each variable, we find that the age of the household head, receipt of food aid, household size and marginal propensity to consume food have VIFs above ten, which indicates the need for additional examination. After serially removing each of the following variables: receipt of food aid, age of household head, and household size and re-estimating we examine the VIFs in the new estimates. We find that excluding these three variables addresses the model's multicollinearity and proceed with estimating the three models presented in the above text.

A2.3: Estimates including multicollinear variables (preference for cash =1)

	Full Model		Model with collinear variables removed	
	Coefficients and Standard Errors	**Variance Inflation Factor**	**Coefficients and Standard Errors**	**Variance Inflation Factor**
Publicly reveal preferences =1	-1.03	2.19	-1.01	2.12
	(0.4722)		(0.4559)	
Respondent gender	1.01	6.02	0.74	5.24
	(0.6742)		(0.6371)	
Household head gender	-0.93	2.68	-0.73	2.60
	(0.6114)		(0.5778)	
Household head age	-0.01	14.30	-	-
	(0.0165)			
Household size	0.02	11.42	-	-
	(0.1227)			
Maximum number of years of schooling in household	0	3.35	-0.03	2.55
	(0.0569)		(0.0517)	
Marginal propensity to consume food	0.64	12.24	-0.30	7.79
	(1.8275)		(1.6466)	
Per capita food expenditure in past two weeks in 1000s of shillings	1.52	3.97	1.05	3.62
	(1.2013)		(1.0674)	
Per capita annual cash income in 1000s of shillings	0	2.17	0	2.01
	(0.0039)		(0.0037)	
Take food on credit at least weekly = 1	-0.02	2.70	-0.07	2.64
	(0.494)		(0.4748)	
Received food aid = 1	3.07	22.73	-	-
	(1.507)			
Shared food aid = 1	-0.37	4.26	-0.11	3.85
	(0.6229)		(0.5581)	
Number of minutes to main market used by household	0	1.23	0	1.21
	(0.0009)		(0.0009)	
Dirib Gombo	-1.17	2.44	-0.95	2.06
	(0.7751)		(0.7199)	
Kargi	0.57	2.50	0.54	1.93
	(0.8442)		(0.7865)	
Logologo	-0.43	2.78	-0.30	2.32
	(0.8686)		(0.8076)	
Loyangalani	0.12	2.58	0.26	1.81
	(0.878)		(0.8161)	
Constant	-1.67		1.36	

	(2.4001)		(1.4158)
R-squared	0.1467		0.1125
Mean VIF		5.86	

Results indicate that the two groups are balanced, and as a result, the treatment, rather than differences within treatment groups, drives the result. Our control variables in Model 2 appear to explain little of how respondents choose between cash and some food. The effects of these additional covariates are small and not significant, giving us reason to believe that Model 1 is sufficient.

A2.4: Results from student t-tests on differences of respondent characteristics assigned to reveal preferences either privately or publicly

	T-test	Pr(|T|>|t|)
Respondent is female = 1	1.0263	0.3068
Respondent's household head status and gender	1.3830	0.1693
Household head age	-0.2338	0.8156
Maximum number of years of schooling in household	-0.8158	0.4162
Marginal propensity to consume food	-0.1286	0.8979
Per capita food expenditure in past two weeks in 1000s of shillings	0.1960	0.8449
Per capita annual cash income in 1000s of shillings	-0.2330	0.8162
Take food on credit at least weekly = 1	-0.7066	0.4812
Shared food aid = 1	-1.0389	0.3010
Number of minutes to main market used by household	-0.4605	0.6460

CHAPTER 3

COMMUNITY CHARACTERISTICS, REFERENCE GROUP INEQUALITY AND SUBJECTIVE WELLBEING: FINDINGS FROM SUB-SAHARAN AFRICA

Abstract

Advances in standards of living and sociopolitical stability arguably turn less on objective, statistical measures of incomes, expenditures or other standard indicators than on people's subjective assessments of their own wellbeing. Yet, we know surprisingly little about subjective wellbeing in less developed countries. Combining DHS and Afrobarometer data for ten sub-Saharan African countries, I estimate a series of ordinal logistic regressions to make two interventions to the subjective wellbeing (SWB) and inequality literatures. First, I find that social environment characteristics, such as crime rates and community health, which are not commonly included in SWB studies, matter for subjective wellbeing. Second, I contribute to an ongoing debate about relative deprivation in low-income countries. While using standard reference group leave-out mean measures, I do not find evidence of relative deprivation. I do, however, find that the degree of inequality within the reference group dampens the impact of a marginal increase in an individual's economic attributes on SWB. I term the effect of reference group inequality on wellbeing "inequality-based relative deprivation." This latter pair of findings indicates that, in this survey, inequality matters more to respondents' perceptions of their lives than mean measures. Thus, relative deprivation studies relying on reference group means may miss an important form of relative deprivation.

Introduction

In recent years, an explosion of research raises the question of whether relative deprivation — the study of how people's feelings about their lives are influenced by characteristics of their social comparators —is a universally experienced phenomenon. Researchers consistently find evidence of relative deprivation in high-income countries. Residents of high-income countries tend to experience lower wellbeing when their reference groups are financially better-off than they are (Runciman 1966; Diener et al. 1999; Frey and Stutzer 2001; McBride 2001; Luttmer 2005; Ferrer-i-Carbonell 2005; Graham 2009). We know less about relative deprivation in low and middle-income countries both because very few studies examine relative deprivation in these countries and because findings from these studies are mixed. At least one study finds evidence of relative deprivation, although other studies find that at least some respondents experience higher senses of wellbeing when their reference groups are better-off than themselves (Senik 2004; Kingdon and Knight 2007; Fafchamps and Shilpi 2008; Ravallion and Lokshin 2010). In this paper, I contribute to the debate on relative deprivation in low-income countries. I argue that to understand relative deprivation in sub-Saharan Africa and elsewhere, we need to broaden the debate away from a narrow focus on mean reference group income measures and toward inclusion of reference group inequality measures and non-economic, community-based measures. By building on Durkheim's (1951 (1897)) insights into resources and relative wellbeing, I find that inequality-based relative deprivation is not unique to high-income countries.

Against the backdrop of increased attention to global inequality, the debate

over the existence of relative deprivation in less developed countries assumes increasing importance. An implication of relative deprivation is that increasing disparities between people and their social comparators could leave people feeling worse off, even if their incomes increase (Layard 2005). However, if relative deprivation does not exist, it may be that having a better-off reference group provides important positive externalities, perhaps especially in low and middle income countries with weak institutions and volatile economies (Senik 2004; Bookwalter and Dalenburg 2010; Ravallion and Lokshin 2010). In studies finding no relative deprivation, there is an assumption that people in high-income countries are somehow different, and thus more likely to experience reference group deprivation, than people residing in low and middle income countries. Nonetheless, Runciman warns that even when relative deprivation is not observed, "we must beware of confusing acquiescence with contentment" (1966, p. 26). Inasmuch as improving subjective wellbeing – how people perceive their lives – is a valued policy outcome, identifying the different factors, including relative deprivation, that shape subjective wellbeing can help policymakers select policies that could improve people's perceptions of their lives. Further, understanding how different forms of inequality shape wellbeing helps us to explore whether people perceive inequality as detrimental to their lives, potentially informing long-standing growth-equity debates. Moreover, it could inform understandings of how and why people make decisions to join social movements, participate in civil society, and engage politically.

Relative deprivation studies in low-income countries and elsewhere have examined differences in income or consumption between the referent group and the

respondent and how those differences impact a respondent's subjective wellbeing. Few studies have examined whether non-economic forms of deprivation influence SWB, although Runciman argued that relative deprivation could result from differences in power, class and status (Runciman 1966; Fafchamps and Shilpi 2008; Graham 2009). Examining non-economic factors, such as crime, community health, and availability of community services in absolute levels and associated inequality measures may be salient for identifying relative deprivation in sub-Saharan Africa, especially because these sorts of attributes are highly variable both between and within low-income countries (Lipton 1977; Sahn and Stifel 2003; Bezemer and Headey 2008; Acemoglu and Robinson 2012).

Further, most studies of relative deprivation are limited to reference group means. Few relative deprivation studies have examined whether the degree of dispersion of a reference group's income or consumption influences a respondent's SWB (an exception is Senik 2004). Yet, inequality – the degree of dispersion - may matter. If referent group incomes are widely dispersed, a respondent with an income further from the referent group mean may not feel as strongly affected by relative deprivation. However, when referent group income is tightly clustered around the mean, a respondent whose income falls outside of this cluster may feel abnormally fortunate or unfortunate and may report his or her wellbeing as much lower (in the case of income being below referent group income) or much higher.

In this paper, I advance our understanding of when and why sub-Saharan Africans feel better or worse about their standard of living. With data from ten sub-Saharan African countries, I estimate a series of ordinal logistic regressions to unpack

the relationships between subjective wellbeing and a range of community attributes, demographic characteristics, and reference group measures in order to identify if and when sub-Saharan Africans experience relative deprivation. Specifically, I make two interventions into the subjective wellbeing literature. First, I find that community characteristics are important, non-economic factors that shape people's perceptions of their lives. Second, I expand the concept of relative deprivation to include inequality. I do not find that mean reference group attributes, which capture relative deprivation, matter for SWB. Testing whether reference group inequality matters, even when mean reference group measures don't, I estimate reference group Gini coefficients for several sources of inequality. I find that crime-based inequality and consumption-wealth based inequality both matter for how sub-Saharan Africans perceive the lives, arguing the latter is evidence of "inequality-based relative deprivation."

Below is a discussion of the literature that motivates this study. After which, follows a description of the data and sample construction. I then present the estimation method, followed by, findings and robustness checks. Finally, I conclude with a discussion of findings, limitations of this research, and directions forward.

Literature and theoretical motivation

Researchers have found consistent relationships between subjective wellbeing (SWB), defined as "a person's cognitive and affective evaluations of his or her life" (Diener et al. 2005, p. 63) and a series of correlates. Diener et al. (2005), in a review article, identify a series of small but significant associations between SWB and several sociodemographic factors. Religious individuals tend to report higher levels of SWB. Women, and younger individuals tend to report slightly higher levels of SWB

although the strength of these findings depends on the specific SWB question used (Diener et al. 2005; see Stevenson and Wolfers 2008 on the disappearing gender gap in SWB in the industrialized world). Income and SWB are positively associated, although changes in income do not, in general, appear to be associated with SWB (Diener et al. 2005; see also Deaton 2008). Other characteristics associated with SWB but not specifically modeled here include personality and genetics, marital status, network connections, and cross-cultural attributes.[12]

The role of reference group economic characteristics on SWB varies by the wealth of the country, and by the wealth of the respondents. Runciman (1966), in his seminal study on relative deprivation and social justice, argues that relative deprivation is the discontent people experience when their reference group has more of something they believe that they are entitled to. The decline of respondent's subjective wellbeing as reference group members (i.e., social comparators) become better off, holding respondent's income constant, is considered to be evidence of relative deprivation (Layard 2002; Ravallion 2012). Relative deprivation has been heavily studied, although the majority of the evidence of the adverse impact of reference group economic characteristics on subjective wellbeing is from high income, industrialized countries (Frey and Stutzer 2001; McBride 2001; Luttmer 2005; Ferrer-i-Carbonell 2005; Graham 2009). A notable exception is Fafchamps and Shilpi's (2008) study in Nepal, where they find relative deprivation effects similar to those in

[12] Psychologists have found that personality and genetics are strongly associated with SWB, although many studies are unable to control adequately for these attributes (Diener et al. 2005). Married individuals tend to report higher levels of SWB. Higher quality and quantity of network connections are also positively associated with wellbeing (Helliwell and Putnam 2004; Degli Antoni 2009; Lim and Putnam 2010; Brashears 2011). Cultural attributes, such as the importance of self-esteem, have been used to explain cross-country differences in SWB although cross-national correlates of SWB are substantial (Suh and Diener 2000; Uchida et al. 2004; Diener et al. 2010).

industrialized countries; the authors do not consider relative deprivation to be exclusively the domain of high-income country residents.

Other studies of wellbeing in low- and middle-income countries find little evidence of relative deprivation. Researchers that don't find evidence of relative deprivation posit that uninsured risk, aspirations, or other positive externalities are more prominent features of life in low income countries than in high income countries and, as a result, having a relatively wealthier reference group is a boon, not a burden (Senik 2004; Kingdon and Knight 2007; Ravallion and Lokshin 2010). Ravallion and Lokshin (2010) find that in Malawi, having richer friends and neighbors is associated with increases in poor respondents' wellbeing. Ravallion and Lokshin (2010) hypothesize that positive externalities of interacting with wealthier friends and neighbors can mitigate uninsured risks. Kingdon and Knight (2007), examining the effects of differently spatially defined comparison groups on SWB in South Africa, find evidence of relative deprivation in spatially distant reference groups but not among more local reference groups. The authors posit, "risk-sharing within a community can provide another reason why [one's] own happiness is raised by other peoples' income" (p. 71). Bookwalter and Dalenberg (2010) confirm Kingdon and Knight's findings in South Africa. At low levels of income, living near wealthier people improves an individual's SWB (Bookwalter and Dalenberg 2010). In a panel study from a middle-income country, Russia, Senik (2004) argues that her findings of a positive relationship between reference group income and subjective wellbeing is evidence of a tunnel effect, where individuals may experience improved welfare because they see others' situations improve and therefore, expect that their situations

will also improve.

Thus, whether relative deprivation is universally experienced or a phenomenon primarily limited to high income countries, is very much unresolved. Long before the debate about the universality of relative deprivation, Durkheim (1951 (1897)) argued that people's aspirations are tempered by the resources available to them:

> "No matter how one acts, desires have to depend upon resources to some extent; actual possessions are partly the criterion of those aspired to. The less one has the less he is tempted to extend the range of his needs indefinitely. Lack of power, compelling moderation, accustoms men to it, while nothing excites envy if no one has superfluity. Wealth, on the other hand, by the power it bestows, deceives us into believing that we depend on ourselves only. Reducing the resistance we encounter from objects, it suggests the possibility of unlimited success against them. The less limited one feels, the more intolerable all limitation appears." (p. 245).

Durkheim's argument that one's desires partially depend on resources is worth revisiting. Durkheim intends "resources" to mean something broader than just income or wealth. His notion of resources includes power and opportunities. I adopt this broader use of resources to include community characteristics. Runciman (1966), like Durkheim, cautions that hardship among poorer members of a population breeds cautious pessimism, thereby reigning in their expectations. Sayer (2005) seemingly concurs, writing that in the face of inequality, resistance may be less rewarding than compliance. In other words, subjective experiences are likely experienced as functions of one's resources-at-hand as well as one's aspirations.

The Durkheimian notion that aspirations may be tempered for society's less powerful members is consistent with, although slightly different from, studies finding no relative deprivation or positive relationships between reference group economic

characteristics and SWB in low- and middle- income countries. Often interpreted as evidence of risk-sharing, aspirations, or other positive externalities, a slightly darker interpretation, consistent with Durkheim and Sayer, is that people do not expect to have better lives and therefore are not bothered, or are even happy, when others around them do well.

While much SWB research focuses either on personality and genetics or on economic factors, few would argue that these factors perfectly reflect individual's wellbeing. Examining relative deprivation relying on economic characteristics of the reference group is also more narrow than Runciman's (1966) description (see also Merton and Kitt's (1950) findings that the basis of soldiers' morale rests on the status of the comparison group). Yet, we know little about the sorts of community attributes that might matter in low-income countries.

Both Fafchamps and Shilpi (2008) and Graham and Hoover (2007) argue that public goods (and their inefficiencies) are rarely adequately measured in current studies of subjective economic wellbeing in low-income countries. In one study, Kingdon and Knight (2007), in their study of subjective wellbeing in South Africa, include cluster-level amenities, such as whether roads are tarred, the distance and number of facilities (e.g., bank, market, health clinic, and post office) available, and distance to public transportation, finding none are statistically significant except cluster – level mean household absolute income. Recently, Easterlin et al. (2011), examining urban-rural differences on subjective wellbeing, find that urban dwellers report significantly higher levels of wellbeing than rural dwellers, particularly in low-income countries. The authors attribute some of the gap in wellbeing to urban-rural

differences in education, income, and occupational status. They do not include measures of community characteristics, which almost surely differ for urban and rural respondents.

Literature on urban bias, dating back to Lipton (1977), repeatedly finds uneven economic policies leading to uneven availability of institutions, infrastructure and income in urban versus rural areas. Unequal investment decisions in services for rural and urban populations could reflect politicians' desire to maintain political support from a densely packed urban populations, or the relative ease of targeting and delivering services to urban areas (Sahn and Stifel 2003; Bezemer and Headey 2008). Thus, people may report higher wellbeing in urban areas not only because of improved individual attributes such as education and income, but also because of better access to – or availability of – infrastructure and institutional access.

Findings from industrialized country studies offer insights into the correlates of subjective wellbeing in low and middle-income countries. The important role of community attributes for wellbeing has been described by William Julius Wilson in his work on the culture of poverty, by Sampson et al. (2002) in their review of neighborhood effects, and has recently been validated in Ludwig et al.'s (2012) study on neighborhood effects in the Moving to Opportunity (MTO) program that finds that having financially better-off neighbors improves one's mental health outlook. Together, these studies suggest that examining community characteristics and their potential role in SWB may be fruitful, particularly in sub-Saharan Africa where public goods are unevenly available.

The literature reviewed suggests incorporating community attributes into

estimates of subjective wellbeing could be productive, although little research on this exists for low and middle-income countries. By incorporating measures of structural attributes within communities, such as health care, access to community services and crime, I can to identify whether the resources available (in Durkheim's sense), and whether reference group characteristics of these resources contribute to or detract from subjective wellbeing. Further, the conflicting findings from the reference group and relative deprivation literature reveals little consensus on the role of reference groups on wellbeing in low and middle-income countries. There is also a surprisingly small amount of research on the role of inequality in subjective wellbeing in less developed countries. I contribute to the debate over relative deprivation in non-industrialized countries by, first, broadening relative deprivation to include non-economic factors, as suggested by Runciman (1966) and, second, by considering inequality within a reference group as a prospective source of influence on subjective wellbeing.

Data, variables, and method

Data

To investigate the roles of reference group characteristics and community attributes on subjective wellbeing, I match Afrobarometer, Demographic and Health Services, World Bank and World Income Inequality data for ten sub-Saharan Africa countries. Afrobarometer round IV (2008-9) is a survey of voting-age citizens' attitudes on the quality of democracy and governance in their countries (Mattes 2009; Afrobarometer 2012). Afrobarometer is limited to "reforming" or democratic sub-Saharan African countries, those who have a multi-party electoral system. The survey does not include fragile or failed states and findings should not be considered

representative of the continent (Mattes 2009). In 2008-9, Afrobarometer was fielded in twenty countries. In ten of these, Round V Demographic and Health Data surveys were fielded, between 2006 and 2008, prior to the Afrobarometer survey. These ten countries comprise the sample. See Table 3.1 for a list of included countries.

Table 3.1 here

The Afrobarometer sampling technique is probability proportionate to population sample (Afrobarometer 2012). First, the sample is stratified by region / province and by urban or rural stratum. Then, eight interviews are clustered within each primary sampling unit (PSU), which is identified using census enumeration areas. In nine countries, about 1200 individuals were sampled. Approximately 2400 individuals were sampled in the tenth country, Uganda. In total, 150 primary sampling units are used in countries with 1200 interviews and 300 units are used in countries with 2400 interviews. These 150 (300) units are allocated across the strata based on the population proportion. Due to ongoing conflict and resulting security concerns during Afrobarometer's Round 4, northern Uganda was not included. All regions were surveyed in the remaining nine countries.

Approximately two-thirds of the Afrobarometer questions are identical across surveys. The remaining questions focus on current political or policy issues relevant to the specific country. Only the questions that are identical across countries are used below. Response rates tend to be quite high. The combined rates of "missing" and "don't know" responses were less than seven percent of the total sample. No one refused to answer any of the questions in which I was interested.

Verifying that samples were drawn from the same strata, I matched

Afrobarometer to the Round V (2006-8) Demographic and Health Services (DHS) data by urban or rural designations within each country. DHS surveys gather nationally representative and cross-nationally standardized information on maternal and child health, as well as other basic demographic information and limited wealth and asset information (Vaessen 2005; Measure *DHS*+ 2008). I constructed urban and rural means by country of several community health variables, including rates of wasting, stunting, undernutrition, diarrhea, and antenatal services use. In order to improve recall about maternal and child health, DHS enumerators elicit information from a female member of the household. Approximately 5000 to 6000 women and their households are interviewed per country. Response rates for the DHS tend to be very high and consistent with Afrobarometer response rates – between 92 and 97 percent (Vaessen 2005).[13]

For each of the ten countries, the Gini coefficients of income inequality are estimates from the UNU-WIDER World Income Inequality Database, Version 2.0c, May 2008 (WIID2).[14] Using World Bank data on gross domestic product (GDP) per country, I estimated the average growth rate in GDP between 2002 and 2006 (World

[13] Most DHS sampling frames follow the same general approach. First, previous censuses or population counts are used to identify primary sampling units (PSUs). PSUs are sampled with probability proportional to population (or number of households). Most DHS surveys rely on geographic stratification, including rural/urban stratum and or regional stratum. In each stratum, the PSUs are selected independently. After the PSUs are selected, if the sampling frame is current, households are sampled randomly from within the PSU (Vaessen 2005). If the sampling frame is out of date, a list of households within each PSU is generated and then households are randomly selected. Within each selected PSU, respondents are randomly selected, with cluster of 30-40 women in rural areas and 20-25 women in urban areas.

[14] WIID2 Gini coefficients are estimated from household surveys and therefore considered to be more reliable than Ginis computed from macro-economic data (Milanovic 2012). Unfortunately, some of the estimates are quite old (Liberia has the oldest estimate from 1974; others are from the 1990s and early 2000s) and may not reflect current levels of inequality.

Bank 2012).[15]

Variables

I construct the dependent variable from Afrobarometer's comparative subjective wellbeing (SWB) question: "In general, how do you rate your living conditions compared to other people living in this country?" on a scale of one (one = much worse) to five (five = much better).

Subjective wellbeing questions are challenging to elicit. The Afrobarometer survey addresses some of the difficulties of eliciting subjective wellbeing in the following ways. First, with regard to findings that wellbeing questions are sensitive to the placement of the question within the survey, the dependent variable is the fifth question in the survey, thereby minimizing the influence of other questions on SWB responses (Graham 2009). Second, Afrobarometer elicits SWB compared to other people within the country. This approach anchors the respondent's reported wellbeing to an identified comparison group (Ravallion 2012). Third, the subjective wellbeing question asks about perceptions of living conditions or satisfaction with life. Such life-satisfaction questions results in more stable responses over time compared to subjective wellbeing questions that elicit affect or emotion (also known as "happiness" questions) (Diener et al. 2005; Deaton 2008; Graham 2009).

Across ten countries, 13,867 respondents reported answers on a scale of one (1= much worse) to five (5=much better). Figure 3.1 indicates that subjective wellbeing varies by urban and rural residency within each country. A higher proportion of rural residents report scores of 2 (worse off compared to others) while a

[15] This five-year timespan ends in the year prior to the first year of Round IV Afrobarometer data collection.

higher proportion of urban residents report scores of 4 (better off). Rural respondents are much more likely to report a score of 1, while urban respondents are more likely to report a score of 5.

Figure 3.1 here

An important component of SWB is economic wellbeing, measured as income, consumption or wealth. Yet, the difficulty in estimating income in low-income countries is well known (Sahn and Stifel 2000; Deaton 2008). Neither Afrobarometer nor DHS attempt to collect detailed income, expenditure or asset information, although both surveys include some proxy measures. Many researchers using these datasets rely on data reduction techniques, such as principal components analysis (PCA) or factor analysis, to compute an index assigning a single wealth and or consumption value to each respondent (Sahn and Stifel 2000; Filmer and Pritchett 2001).[16] See the appendix for more details on the construction of the indices and for robustness checks.

Following the approach of Filmer and Pritchett (2001), I use PCA to summarize a series of highly correlated wealth and consumption variables for each country, storing the first component of the variance-covariance matrix from the PCA as each respondent's consumption-wealth index. PCA captures information that covaries across the set of included variables. The first component is a "linear combination of the variables with maximum variance" (Filmer and Pritchett 2001).

[16] Sahn and Stifel (2000) argue that factor analysis is more appropriate than principal components analysis when an underlying, theoretical model is known. I use principal components analysis rather than factor analysis because I am unaware of a strong underlying theoretical model that combines wealth and consumption and do no wish to impose a structural model using the very limited asset and consumption information available.

The dependent variable asks respondents to consider their wellbeing relative to other residents in their country. Therefore, I predict the first component by country, so that the index score for each respondent is relative to other citizen-respondents in their country.

My starting point is Mattes' (2009) Lived Poverty Index, which includes responses to six Afrobarometer questions focusing on consumption: "over the past year, how often have you or your family gone without food, [water, medical treatment, cooking fuel and cash]?" Responses vary on a scale of zero to four, reflecting responses of "never" to "always." In addition to these consumption measures, I include asset information, including indicators water availability inside the house or compound, ownership of radio, television, and motorvehicle, and access to cash employment.[17] By combining consumption and wealth measures, I expect that the consumption-wealth (c-w) index can identify impoverished households, as well as capture more differentiation among well-to-do households that do not regularly go without basic consumption items but have varying levels of wealth.[18]

I created three other indices: a community services index, a crime index, and a perception of government index, all of which include the first scores generated from a principal components analysis for each country. Similar to the consumption-wealth index, within each index, variables were highly correlated. The community services index includes the following indicator variables: availability of schools, clinics,

[17] Before computing the PCA, I inverted the consumption measures so that a higher response indicates greater consumption in order to be consistent with the asset indicators.

[18] Rutstein (2007) has noted that the wealth index generated with DHS data has been accused of being urban biased. Given that Afrobarometer shares with DHS a lack of information on land and animal holdings, it is likely that the same critiques apply to this index.

market, police, paved road, and cellular phone reception in the enumeration area.[19] The underlying variables in the community services index are indicator variables reported by the enumerator rather than by the respondent. One limitation of the community services measure is that while each service may be observed as available by an enumerator, it may or may not be accessible to individual members. The crime index includes the following variables: frequency of robberies in the past year, frequency of attacks in the past year, and fear of crime. The coding of responses are as follows: never is zero, experienced once or twice is one; several times is two; many times is three; and always is four. The perception of government index includes a ranked assessment of respondent's perception of the government's job at addressing each of the following social issues: poverty, income inequality, crime, health and food security. Reports are on scales of one (very badly) to four (very well). Table 3.2 reports the proportion of the total variance explained by the first component for each PCA analysis. Results vary by country. Robustness tests presented in the appendix indicate that the indices are internally coherent.

Table 3.2 here

Following our PCA analyses, I computed reference group leave-out means and Gini coefficients for consumption-wealth index, the community services index, and the fear of crime and crime index. Similar to other relative deprivation researchers, I rely on spatial measures to define reference groups (Senik 2004; Kingdon and Knight

[19] I also rescored the DHS Z-scores to obtain nonzero, positive values to create a DHS Health Gini coefficient, which included several measures of child under-nutrition as well an information on use of skilled birth attendant, and frequency of antenatal visits. I do not use or present results from the DHS health Gini because the results mask the heterogeneity found across the different community health measures, as seen below in the appendix on the robustness of the findings to different specifications.

2007; Fafchamps and Shilpi 2008; Bookwalter and Dalenberg 2010). Respondents are placed in a reference group based whether they reside in urban or rural areas within each country, for a total of twenty groups.[20] I follow the standard approach of generating leave-out mean measures by reference group that exclude the respondent's own value when computing his or her reference group mean.

I also compute Gini coefficients, which allow me to examine whether reference group inequality and its relationship with individual SWB differs from SWB's relationship to leave-out mean reference group attributes. Traditionally used to measure income inequality, Gini coefficients capture the dispersion of values within reference groups.[21] Gini coefficients are bounded between zero and one. A score of one indicates complete inequality (e.g., one person has all the income, or experiences all the crime) and a score of zero indicates that the attribute is evenly shared across the population.

Tables 3.3-3.5 provide descriptive statistics of our independent variables, first across the entire sample (Table 3.3), and then by rural (Table 3.4) and urban residency status (Table 3.5). I present sociodemographic characteristics, reference group characteristics, interaction terms and country-level measures including income-based Gini coefficients and average GDP growth rate for the five-year period preceding the Afrobarometer survey (2002-2006). Schooling is divided into four categories: no formal schooling (category includes Koranic or other informal schooling); some or

[20] As Runciman (1966) and Ravallion (2012) have noted, relying on analyst-defined groups may miss other important reference groups, an issue explored elsewhere (Lentz 2013).
[21] In order to compute Gini coefficients from the PCA scores, I transformed the underlying variables to be nonzero and positive. This rescoring does not change the underlying meaning of the ordinal values since the ranking and distance between each value was preserved.

finished primary school; some or finished secondary school; any post secondary education, including certificate programs. Following the Afrobarometer research of Bratton et al. (2005), minority language is coded one for those who speak a language at home that spoken by less than 10% of population and zero otherwise.

Table 3.3 here

I include one additional community attribute measure. I match a DHS-derived health measure, wasting, to Afrobarometer respondents based on residency. Wasting is a highly visible manifestation of poor health among a vulnerable population, children under the age of two. I compute wasting rates for urban and rural residents in each country as the proportion of children under age two who have weight-for-height z-scores below two.[22]

Tables 3.4-3.5 here

Urban residents tend to be slightly younger, more educated, and less likely to speak a minority language in their home. On average, they have lower rates of wasting among children under two years old, have greater access to services and experience and fear less crime than rural residents. These findings are consistent with other studies' findings of urban bias (Lipton 1977). For example, the prevalence of under-nutrition is consistently higher among rural children than among urban children (Smith

[22] DHS captures several different health variables, particularly related to the health of women and infants. I use wasting because it is a highly visible sign of poor health that can be readily observed by everyone in the community. In what follows, similar results hold regardless of the particular undernourishment measure used, including wasting, stunting, and undernutrition for children under the age of two. Access to and frequency of use of prenatal care are not statistically significant, perhaps because these are less visible signs of community health. The appendix includes detailed findings as well as a discussion of why the different associations between various measures and SWB may be observed. Because wasting rates were computed as a community means using DHS data, wasting rates for individual respondents are not available. Therefore, I cannot include measures of health inequality by reference group.

et al. 2005). Incomes also tend to be higher in urban areas; the difference is particularly striking in low-income countries in sub-Saharan Africa (Lipton 1977, Sahn and Stifel 2003, Bezener and Headey 2008, Easterlin et al. 2011).

Figure 3.2 here

Figure 3.2 plots averaged subjective wellbeing and averaged consumption wealth index for urban and rural reference groups in each country. I expect these results to be consistent with findings that other financial measures, such as income, positively influences wellbeing (e.g., Veenhoven 1991). The figure shows that SWB is positively related to consumption-wealth index. As expected, the general trend of wellbeing is increasing with the index. The reference group mean SWB is clustered within 2.4 and 3.4, indicating on average, respondents think their standards of living are slightly above or slightly below everyone else's (a score of three indicates that a respondent's living standards are the same as others in the country). However, differences across countries also indicate that the consumption-wealth measure is an imperfect predictor of SWB. Urban and rural Liberians report higher SWB and urban and rural Kenya report lower SWB than the general trend. While Kenya ranked 144th and Liberia ranked 176th out of 179 countries in the UNDP's 2008 Human Development Index (2008 was the year of the Afrobarometer survey), Kenya's mean SWB scores are lower than Liberia's. This could indicate cultural differences (e.g., the commonly-held belief that West Africans are more cheerful than East Africans), memory on the part of Liberians about life during the recent civil war being quite bad compared to today, Kenyans' recent experience with ethnic violence following elections in late 2007 or other factors.

Method

The dependent variable, subjective wellbeing, is measured on a scale of one to five. Other researchers have found that ordinary least squares (OLS) is suitable for estimating SWB when it is measured on an scale of zero to ten (e.g., Easterlin et al. 2011). With the dependent variable having only five categories, as a more cautious approach, I estimate an ordinal logit rather than an OLS model. An ordinal logit can better incorporate potential differences in scale between response categories that an OLS regression would treat as equivalent and will avoid potentially biased inconsistent and inefficient results that could occur if OLS is applied incorrectly.

The general form of the model is presented below in equation 1:

$$y^* = \alpha + \boldsymbol{I_i'\beta} + \boldsymbol{X_i}'\boldsymbol{\gamma} + \delta_j C_j + \rho_i U + \boldsymbol{RG_i}'\boldsymbol{\theta} + \varepsilon$$

$$y = \begin{cases} 1 \; if \; y* \leq \mu_1 \\ 2 \; if \; \mu_1 < y* \leq \mu_2 \\ 3 \; if \; \mu_2 < y* \leq \mu_3 \\ 4 \; if \; \mu_3 < y* \leq \mu_4 \\ 5 \; if \; \mu_4 < y* \end{cases} \qquad (1)$$

The underlying latent response, y* is unknown. Observed responses are an ordered set of discrete responses, y, which groups y* into one of five response categories. The parameter α is a constant; $\boldsymbol{I}_i$ is a vector of individual attributes of interest, including respondent's consumption-wealth score, assessment of government efficacy score, access to community services score, experience of crime and fear of crime score. Also included in vector $\boldsymbol{I_i}$ is the rate of wasting among children under age two in the respondent's reference group. C_j are a series of indicators variable taking a value of one for each of j countries; U is an indicator taking a value of one for residents of urban areas and zero otherwise for each respondent i. $\boldsymbol{X_i}$ is a vector of

control variables and ε is the error term.

The vector $\boldsymbol{X_i}$ control variables include demographic and personal characteristics and country attributes, including income Gini coefficients and growth rates. The included sociodemographic variables, age, gender, schooling, minority status, and religion, have been found in other studies to be consistently important for SWB or important to include as controls (Diener et al 2010; Easterlin et al. 2011). I include frequency of listening to the radio, as a way to capture whether people are engaged with the outside world. This could be a valid concern in remote regions of sub-Saharan Africa, where residents may only have a limited sense of what life is like outside their village, relative to those who have more frequent contact with the outside world.

$\boldsymbol{RG_i}$ is a vector of the leave-out mean reference group values of the consumption-wealth index, the community service index, and the crime index for respondent *i*. Reference groups are composed of other urban (rural) respondents within each country for each urban (rural) respondent. Lastly, I consider an alternative specification that replaces vector $\boldsymbol{RG_i}$ with reference group Gini coefficients of consumption and wealth index scores, crime and crime risk index scores, and index scores of community services. I also include interaction terms of an individual's index with the reference group Gini coefficient.

Prior to estimating the correlates of subjective wellbeing, I made two post-survey adjustments. First, both the DHS and Afrobarometer data are weighted. The Afrobarometer data were weighted across and within country to adjust for failures to sample from certain population units. These weights were computed using the most

currently available census data. Similarly, DHS data are weighted in order to be representative; DHS oversamples in geographic areas with small percentages of the population. Second, as discussed in the section on robustness checks and in the appendix, I estimated the models using multiply imputed data as well. The results are robust to chained multiple imputation and given the low-degree of missingness and for ease of interpretation, I present the non-imputed findings here.

Findings, robustness checks, and discussion

Findings

The role of reference group attributes on subjective wellbeing is inconsistent across studies on subjective wellbeing in low-income countries. Table 3.6 presents coefficients from four ordinal logistic regressions estimated to identify if and when sub-Saharans experience relative deprivation, and whether relative deprivation is limited to economic factors or can result from community-attributes as well. Due to unobserved heterogeneity, the relationships between wellbeing and individual attributes should be treated as associational rather than causal.

Model 1 includes the usual socio-demographic correlates of subjective wellbeing. Model 2 adds attributes of the respondents' communities to model 1 to test how, if at all, community attributes shape a respondent's SWB. In models 3 and 4, I examine how mean reference group measures and inequality within reference groups shape subjective wellbeing in sub-Saharan Africa. Model 3 incorporates leave-out mean reference group measures to test whether respondents experience relative deprivation in three categories: consumption-wealth deprivation, crime and crime risk deprivation, and or community services deprivation. Model 4 replaces the three leave-

out mean reference group measures with inequality-based measures and interactions with respondents' own measures to test whether dispersion of reference group characteristics matters for SWB.

1. Initial model of usual correlates of subjective wellbeing

The initial model, model 1, establishes that the usual correlates are consistent with findings from other studies of the correlates of subjective wellbeing. In model 1, an individual's wellbeing is estimated as a function of the individual's attributes and community and country fixed effects. Complete results are presented in Table 3.6.

Table 3.6 here

The coefficient on the consumption wealth index is strongly positively and statistically significantly associated with expected SWB, all else equal: an increase in the consumption wealth index increases the odds of reporting SWB slightly worse or better (SWB >=2) are 1.27 times greater than reporting SWB much worse than others (SWB = 1). A chi-square test indicates that the consumption-wealth index statistically significantly contributes explanatory power to the model at the one percent level (chi2(1) = 172.46). The ordered log odds coefficient estimates of other demographic characteristics including gender, age, religiosity, and schooling contribute to the expected value of SWB as found in other studies (Fafchamps and Shilpi 2008; Ravallion and Lokshin 2010). The coefficient on the use of a radio is also highly statistically significant and positive, suggesting that understanding about the outside world improves wellbeing and that concerns that isolated individuals may report high SWB because they do not have an understanding of what life is like outside their

community do not seem warranted.[23] Lastly, the coefficient on speaking a minority language at home, a proxy measure for ethnicity, has a negative and highly statistically significant relationship with SWB. Given that an explanation in the other direction is unlikely, that is that people with worse living conditions will decide to speak a minority language at home, this would indicate that being a member of a minority language group, all else equal, decreases SWB. The predicted values for each model of subjective wellbeing are presented in Table 3.7.

Table 3.7 here

The within-country variation between urban and rural communities visible in Figure 3.2 is captured in model 1, which finds a strongly positive relationship between the ordered log-odds of living in an urban area and expected subjective wellbeing, all else equal. However, from model 1, I cannot identify which aspects of living in an urban area improve SWB. SWB could be higher in urban areas because of improved access to health (as measured by a health outcome – wasting – here), as noted by Smith et al. (2005) or by increased income (Easterlin et al. 2011), or by crime rates, or access to community services. I now turn to testing these attributes in model 2. I expect that as access to services and satisfaction with government efforts increase, and as experience with crime and rates of wasting fall, SWB will increase.

2. Model of attributes of an individual's community and subjective wellbeing

While model 1 demonstrates that living in an urban area is strongly associated with increases in the ordered log odds of SWB, the coefficient on living in an urban

[23] Ownership of a radio is included in the wealth-consumption index, and it is possible that the high degree of significance associated with increased use reflects both use and ownership (many poor and near-poor households cannot afford to own a radio in much of rural sub-Saharan Africa).

area is no longer statistically significant when community characteristics are included in model 2. Including community attributes measures not only decreases the ordered log odds estimate of living in an urban area on expected SWB but also renders urban residence no longer statistically significant. The coefficient on the experience and fear of crime has a negative and highly significant association with wellbeing: a one unit increase in the crime index decreases the odds of reporting an increased level of SWB by about ten percent. Neither coefficient on wasting nor on access to community services index is significantly associated with SWB. A limitation of the community services index is that it is based on enumerator reports of availability, and not on respondent's actual access. If these attributes fail to reflect a respondent's true access or use of services, it would not be surprising that this measure is not significant. Nonetheless, chi square test rejects hypothesis that the explanatory power of the variables community services index, crime risk index, and wasting rate is jointly null at the one percent level (chi2(3) = 38.45). Therefore, I include community services and wasting measures in later models.

A one point increase in the perception of government's handling of various social and economic issues increases the odds of a stating one's SWB is slightly worse off or higher (SWB>=2) than reporting SWB is much worse (SWB = 1) by 1.25 times, all else held constant. This suggests that people who feel that their government is capably handling issues directly relevant to their own lives are happier, holding constant their access to services, experience with crime and proportion of wasting within the community. The strongly positive and highly statistically significant association between perception of government and SWB holds for the later models as

well. Lastly, the consumption wealth index variable remains positive and significant and other demographic characteristics behave similarly to model 1.

Model 2 firmly indicates that crime within the community and people's perceptions of their governments, matter for SWB, all else held constant. In other words, at least some community attributes inform people's assessments of their lives.

3. Model of relative deprivation and subjective wellbeing

Model 3 incorporates relative deprivation measures, computed as the leave-out mean value within each reference group, excluding the contribution of the individual respondent to the value. In model 3, I follow the approach of other relative deprivation researchers, define reference groups spatially based on urban or rural residency status within a country (Senik (2004) and Kingdon and Knight (2007)). If relative deprivation exists, the community means to enter into the model negatively and significantly, but if respondents experience positive externalities from increases to the mean community level, these mean measures will be positive.

In this sample, relative deprivation computed from reference group means does not appear to be a relevant correlate of SWB. None of the three additional measures, leave-out mean consumption wealth index, leave-out mean community services index, and leave-out mean crime and fear of crime measures, are statistically significantly different from zero. The null hypothesis that jointly these three additional variables do not add to the model cannot be rejected (chi2(3) = 5.77) at the ten percent significance level. However, a joint test of the consumption-wealth index and the mean consumption-wealth index rejects the null at the one percent significance level (chi2(2) = 146.21), as does a joint text of the crime index and the mean crime index

(chi2(2) = 36.85); both of these findings likely reflect the value of the individual indices contribution to the model. The coefficients for the other variables are consistent with the coefficients in model 2.

The Akaike Information Criterion measures the comparative goodness of fit across multiple models, by describing the tradeoff between bias and variance; the model with the lowest AIC is the model that minimizes the information lost. The AIC indicates that model 3 is not an improvement over model 2.

Nonetheless, the reference group measures used here, which rely on leave-out mean values of indices, are not identical to other reference group measures using mean income or more complete consumption measures. Further, the reference groups, which slot individuals into rural or urban categories within each country, may be too broad, an issue explored elsewhere (see Lentz 2013). Thus, the lack of statistical significance of the findings fails to confirm either the findings of relative deprivation or the findings of positive externalities in other studies. However, I now turn to examining whether inequality within reference groups does impact SWB in model 4.

4. Model of inequality and subjective wellbeing

Few relative deprivation studies using low or middle-income country data have examined how inequality influences SWB. One exception is Senik (2004), who found that neither Gini nor Stark inequality measures were significant for Russians' subjective wellbeing. Addressing this omission is particularly valuable for understanding SWB in low-income countries, which have uneven institutional capacity both across countries and within them (Lipton 1977; Bezemer and Headey 2008; Acemoglu and Robinson 2012). In model 4, I substitute inequality within

reference group attributes and interaction terms for reference group means to test whether inequality-based relative deprivation exists. The interaction terms enable me to examine whether dispersion of inequality of consumption-wealth, crime, or community services, relative to one's own level of these same factors, impacts wellbeing.

In model 4, I find evidence that the average marginal effect of an increase in the consumption-wealth index on SWB, depends on the degree of inequality. People residing in more unequal environments experience a greater boost to their subjective wellbeing from an increase in their consumption-wealth index relative to people residing in less unequal areas. Thus, reference group inequality dampens the effect of an increase in an individual's own economic attributes. I term this finding "inequality-based relative deprivation."

A chi-square test of the null hypothesis that jointly, the coefficients on the consumption wealth index, the consumption wealth Gini, and the interaction term are not statistically different from zero rejects the null (chi2(3) = 149.87). Holding the community consumption-wealth index fixed at a series of values, I compute the average marginal effect of consumption-wealth Gini on SWB, as seen in Table 3.8. All the other covariates are evaluated at their means. I do not find that a marginal increase in inequality statistically significantly effects subjective wellbeing.

Table 3.8 here

Table 3.9 includes the marginal effect of an increase in the consumption wealth index on SWB, evaluated at different values of the consumption-wealth Gini, holding other covariates at their means. This table shows that in communities with lower levels

of inequality, such as urban Nigeria and urban Kenya, an increase in own consumption-wealth has a smaller marginal impact on SWB than for more unequal reference groups, such as residents of rural Zimbabwe or rural Uganda. These results, which are almost universally highly statistically significant, indicate that increases in consumption and wealth matter more for SWB in places where people face more extreme inequality than where reference group inequality in lower. Inequality within a social environment undermines the effect of an increase in consumption-wealth index.

Table 3.9 here

Similar to the consumption-wealth variables, a joint chi-square test of the crime index and its related measures rejects the null (chi2(3) = 43.61) at the one percent level. 46 percent of respondents have the lowest score, indicating having little to no experience with or fear of crime. The mean is -0.289 and the standard deviation is 1.21. Table 3.10 reports the marginal effect of an increase in the crime Gini evaluated at different values of the crime index, holding all other covariates at their means. A marginal increase in the crime Gini, which indicates that crime is becoming more concentrated, for all levels of an individual's own experiences and fear of crime results in negative odds of reporting low levels of SWB and positive odds of reporting higher levels of SWB. Thus, when the amount of crime becomes marginally more concentrated within a reference group, people feel better, all else equal.

Table 3.10 here

Accounting for variation in individual's responses to inequality results in the coefficient on wasting to become statistically significant. The estimated ordered log odds for a one percent increase in wasting in children under two becomes more

negative and highly statistically significant with the inclusion of the inequality measures and the interaction measures for the other attributes. Strikingly, the odds ratio is 0.005; a one percentage point increase in wasting in model 4 decreases the likelihood of reporting a higher level of SWB by 99 percent. The negative ordered log odds suggests two interpretations. First, the overall health of a community, which can be readily observed through the degree of wasting in the community, may be a proxy of an individual's own health status, which is linked to SWB. Second, seeing wasted children may make people feel depressed or frustrated, and thus may decreases one's own SWB.

Testing jointly whether the three community service measures are statistically significantly different from zero, I fail to reject the null (chi2(3) = 5.25). Given that the community services measure is a proxy for a respondent's true access to community services, re-estimating these findings with respondent reported measures would better answer whether community services matter for SWB, as the crime index, consumption-wealth index, perception of government index and rate of wasting do. The coefficients for most of the sociodemographic measures in model 4 remain consistent with the earlier models.

Across models, a respondent's perception of government's performance in addressing social issues is strongly positively associated with wellbeing. One explanation is that optimists are more inclined to both see their own living conditions and their government through rose-colored glasses and will report higher levels of both. A second explanation is that government efficacy does matter for the lives of its residents, perhaps particularly in developing countries, where the quality of

governance is highly variable. Relatedly, those who believe the government is attending to important social needs feel valued as residents by their government and feel that their concerns have been heard, improving their own sense of wellbeing. Data on personality traits would help to unpack this relationship.

The AIC indicates that model 4 is the best fitting model among the four. The predicted probabilities, evaluated at the means of independent variables, from models 1- 4 are shown in Table 3.7. The models' predicted probabilities are consistent with the distribution of subjective wellbeing responses computed from the descriptive statistics.

Robustness checks

I perform several robustness checks on the results. First, I discuss in detail in the appendix the internal and external consistency of the wealth-consumption index, finding that the measuring is internally consistent but that a lack of appropriate benchmarks limits my ability to establish external consistency (Filmer and Pritchett 2000).

Second, after combining the ten DHS community averaged datasets with the Afrobarometer data, I used multiple imputation then deletion to estimate "missing" and "don't know" responses in the Afrobarometer data. The overall degree of missingness among the fourteen variables with missing information is quite small; the highest was seven percent. Examining missing values and don't know responses, I found no observable patterns. Using chained multiple imputation in Stata version 12, I imputed missing data for both continuous and discrete variables, generating five datasets. Following Johnson and Young (2011), my imputation model included the

same set of variables as the analysis model, including interaction terms. I also included two relevant auxiliary variables: electricity access and access to paved road. Estimates from the five datasets were pooled with the MIM prefix in Stata version 12. The imputation models' results are consistent with complete case analysis results. The imputed models' coefficients are neither consistently higher nor lower than the coefficients of the complete case models. See the appendix for more details on imputation and on results generated with imputed data.

Third, the models are robust to alternative specifications of key variables, including the individual variables underlying each index, although not all variables can be included at the same time due to multicollinearity. I also tested other community-health variables computed from the DHS, finding the degree of stunting, undernutrition, and diarrheal diseases also decrease the log odds of SWB. Models 2-4 are robust to several different measures of community health. Rates of wasting, stunting, and undernourishment among children younger than two years similarly impact subjective wellbeing. All of these measures were computed using DHS data aggregated at the community level within each country. See the appendix for results and more details.

Fourth, I test the estimation approach by estimating the same series of models using an ordinal probit model, finding the models robust to this alternative estimation approach. Results are in the appendix. The variables' coefficients differ slightly, however, the key variables of interest remain statistically significant, usually falling within the same interval of statistical significance. The probit models' coefficients tend to be slightly lower than the logit estimates. One difference is that the ordinal

probit estimation indicates that wasting is statistically significant at the ten percent level in model 2, the community attributes model. It is not statistically significant in the ordinal logit model, although it cannot be rejected at the 13 percent level.

Summary of main findings and discussion

1. Summary of main findings

I contribute two main findings that expand our limited knowledge about subjective wellbeing in low-income countries and how relative deprivation, inequality and community attributes contribute to people's perceptions of their lives. First, model 2 demonstrates that community characteristics are important, non-economic factors that shape people's perceptions of their lives for residents of ten countries in sub-Saharan Africa. A narrow focus on economic measures and individual sociodemographic characteristics misses other meso-level factors associated with SWB. Specifically, increases in the degree of crime experienced and fear of crime adversely impact wellbeing while increases in the perception of government performance improve the odds of increased wellbeing.

Second, in model 3, I estimate whether leave-out mean reference group levels of consumption-wealth, crime, and access to community services matters for SWB. Contrary to other findings, I find no evidence of either relative deprivation or of positive externalities. Replacing leave-out means with the reference group Gini measure, and an interaction term of the Gini and the respondent's own score, in model 4, I find statistically strong evidence of consumption-wealth inequality decreasing the impact of an increase in the consumption-wealth index on SWB, which I term "inequality-based relative deprivation." In reference groups with lower inequality,

increases in consumption-wealth index have a smaller (absolute) marginal effect on SWB than in reference groups with higher inequality. In other words, relative deprivation, in this sample, is an inequality-based phenomenon and which dampens the impact of increases in consumption-wealth. I also find the rate of wasting for children under two adversely impacts SWB and that increases in the inequality of crime (i.e., a concentration of crime indicates a decreased probability of any individual experiencing crime) increases SWB.

2. Discussion

This study aims to contribute to a re-assessment of the broader question of inequality in development. Durkheim was correct when he wrote, "desires depend upon resources to some extent" (p. 245). I find that individuals' assessments of their own well-being varies with policy-related variables such as physical security and health care. My findings also indicate that desires depend on how equitably resources are distributed. In other words, not only do community attributes matter for subjective wellbeing, but also inequality-based relative deprivation matters for SWB, although its impact depends on where individuals are in the distribution.

The life satisfaction of the poorest is most adversely impacted by inequality, whereas mean measures of relative deprivation do not appear to exert influence on sub-Saharan Africans' subjective wellbeing. Evaluating mean reference group characteristics (net of the individual's component) may miss important ways in which inequality can shape SWB. As Morgan (2006) argues, research on inequality often considers it an outcome; inequality is less often used as a predictor. An important next step is to establish whether inequality-based relative deprivation matters in other low-

income country datasets that have richer expenditure and income measures. Such future findings could resolve the debate regarding the existence of relative deprivation in low-income countries.

If improving subjective wellbeing is a valued policy outcome, understanding the role of inequality in wellbeing can help inform investment decisions for policymakers (Layard 2005). The strong, positive relationship between respondents' assessments of their governments' ability to address social issues and SWB suggests that respondents derive increased satisfaction from their lives when they believe their government is productively engaged with social issues. My findings also indicate that declines in wasting rates and crime will improve respondents' subjective wellbeing. Life satisfaction of poorer segments of the population will also improve with declines in consumption and wealth inequality. While the research focuses on findings from sub-Saharan Africa, these findings highlight the importance of non-economic social environment attributes, which may be relevant for other settings as well. Those interested in how people make decisions, such as whether to join a social movement, can also benefit from an increased understanding of what factors contribute to people's perceptions of their lives.

There are a series of methodological challenges associated with the study of subjective wellbeing (Frey and Stutzer 2001; Helliwell and Putnam 2004; Krueger and Schkade 2008; Graham 2009; Conti and Pudney 2011; Ravallion 2012). First, I do not have psychometric measures of personality traits that almost certainly contribute to an individual's sense of wellbeing (Deiner et al. 2002). The second challenge is latent unobserved heterogeneity. Urban-rural inequalities are endogenous to migration

decisions, something I cannot adequately control for (Sahn and Stifel 2003). To the extent that happier people are able to build or advocate for better communities, the results are consistent with this interpretation. Nonetheless, the deep literature on urban bias (Lipton 1977; Sahn and Stifel 2003; Bezemer and Headey 2008) suggests that urban-rural disparities in access to schools, markets, health facilities, and in nutritional outcomes etc. are longstanding. Relatedly, I examine wellbeing relative to urban and rural reference groups within each country. As others have noted, this may not be the most relevant referent group, an issue explored elsewhere (Kingdon and Knight 2007; Ravallion 2012; Lentz 2013). Third, the concepts of happiness or wellbeing may mean different things in different cultures (Uchida et al. 2004). Relatedly, many of the Afrobarometer questions have ordinal responses. The meaning of the ordinal orderings may not be universally agreed upon by respondents. However, differences in interpretation of SWB and other questions may be heterogenous and therefore may not bias the results in a particular direction (Ravallion 2012). Deiner et al. (2010) find that SWB's association with many factors is consistent in cross-national studies. Given the paucity of data on sub-Saharan Africa SWB, this warrants further research. Fourth, the lack of significant relationship between mean reference group attributes and SWB in this study are not necessarily inconsistent to other findings in low and middle-income countries (Senik 2004; Kingdon and Knight 2007; Ravallion and Dokshin 2010). The consumption-wealth index is a proxy that may not produce findings equivalent to studies using other objective measures of economic wellbeing.

Although these concerns are important, subjective wellbeing assessments nonetheless remain informative, particularly as we aim to better understand what

forms of inequality and what community attributes are associated with subjective wellbeing. As Massey (2002) argues, paying attention to emotions, subjective interpretations, and perceptions provide critical ways to rethink rationality. Potentially, a better understanding of the correlates of subjective wellbeing will allow us to understand and predict behavior in more robust ways by incorporating factors important for subjective wellbeing such as relative deprivation, instability and vulnerability, aspirations, cultural norms, and or mutual insurance. A sociological contribution to the study of development in the coming years might be understanding subjective wellbeing and inequality not as epiphenomenal to development in sub-Saharan Africa, but as central to the ways that people make decisions about, adopt, and reject a range of livelihood choices, civic engagements, and development interventions.

Figure 3.1: Histogram of subjective wellbeing by community

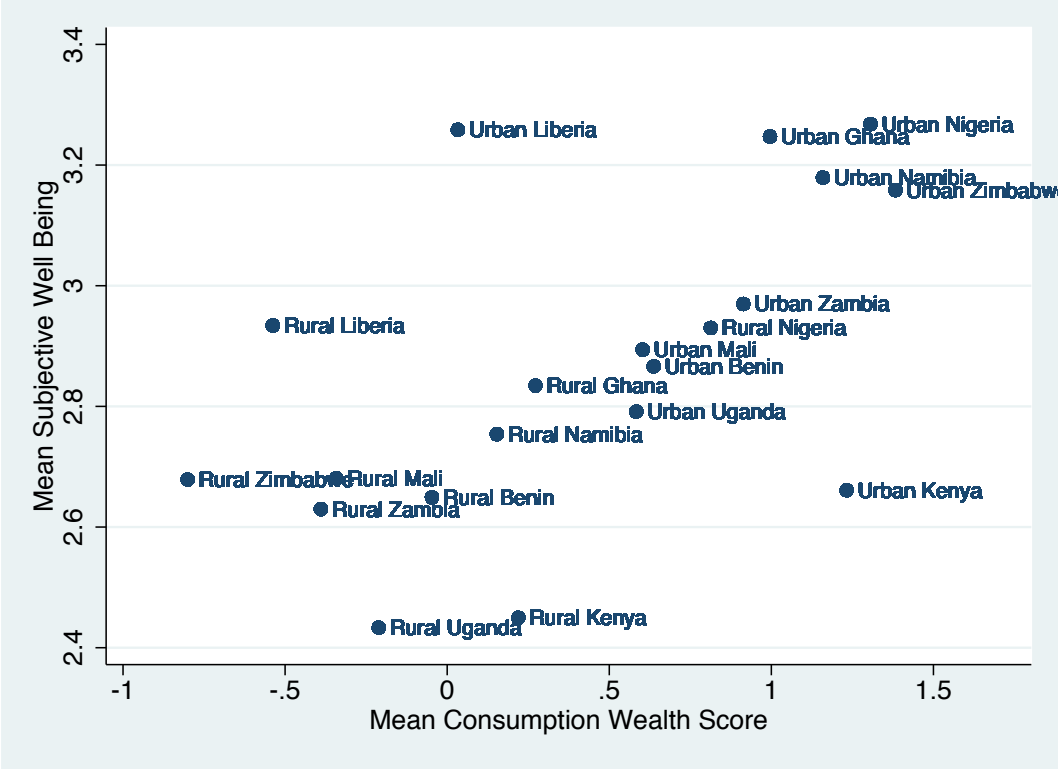

Figure 3.2: Consumption wealth index and subjective wellbeing by community

Table 3.1: List of survey countries included and year of survey

Country	Afrobarometer Round IV	Demographic and Health Survey (DHS) Round V	UNU WIDER Gini Estimates
Benin	2008	2006	2003
Ghana	2008	2008-09	1999
Kenya	2008	2008-09	1997
Liberia	2008	2007	1974
Mali	2008	2006	2001
Namibia	2008	2006-07	1993
Nigeria	2008	2008	2003
Uganda*	2008	2006	2002
Zambia	2008	2007	2004
Zimbabwe	2008	2005-6	1990

Notes:
*Northern Uganda was excluded from the Afrobarometer survey due to security concerns.

Table 3.2: Variation explained by the first component for each principal component analysis by country

	Consumption-wealth	Perception of government	Crime and crime risk	Access to community services
Benin	0.29	0.61	0.58	0.44
Ghana	0.30	0.56	0.47	0.48
Kenya	0.30	0.42	0.54	0.37
Liberia	0.22	0.52	0.54	0.42
Mali	0.25	0.49	0.62	0.49
Namibia	0.35	0.44	0.60	0.40
Nigeria	0.34	0.56	0.61	0.33
Uganda	0.31	0.49	0.56	0.39
Zambia	0.27	0.54	0.48	0.42
Zimbabwe	0.24	0.60	0.50	0.43

Table 3.3: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Subjective wellbeing (1-5)	13867	2.817	1.049	1	5
Sociodemographic Measures					
Female = 1	14291	0.500	0.500	0	1
Age	14207	35.097	13.628	18	110
Age squared	14207	1417.505	1177.693	324	12100
Education category (0-3)	14268	1.439	0.955	0	3
Minority language = 1	14288	0.412	0.492	0	1
Religiosity (1-4)	14036	3.819	0.542	1	4
Frequency of listening to radio news	14281	1.436	0.709	0	2
Consumption wealth index	13992	0.279	1.274	-2.580	4.251
Perception of government index	13271	-1.084	1.797	-3.956	3.901
Access to community services index	14029	-0.573	1.701	-3.917	1.773
Experience and fear of crime index	14215	-0.209	1.213	-1.095	6.656
Reference Group Characteristics					
% of under 2s wasted for reference group	14291	0.175	0.050	0.094	0.285
Mean consumption wealth	14291	0.284	0.638	0.800	1.397
Mean community services	14291	-0.571	0.971	2.421	1.546
Mean crime and fear of crime	14291	-0.209	0.232	-0.633	0.274
Consumption wealth Gini	14291	0.406	0.057	0.305	0.498
Community services Gini	14291	0.184	0.052	0.045	0.257
Crime and fear of crime Gini	14291	0.436	0.033	0.387	0.532
National Level Controls					
National Gini	14291	46.891	9.582	36.500	73.900
Country GDP growth rate	14291	4.528	4.089	-8.174	7.826
Urban = 1	14291	0.360	0.480	0	1

Notes:
To create community characteristics, I divide the country into rural and urban areas and compute community level characteristics based on either rural or urban information.
The consumption wealth index, the community services index, the crime index, and the perception of government index are the first scores generated from a principal components analysis for each country.
The consumption wealth index includes the following variables: past year's frequency of adequate availability of food, cash, water, medical care, and fuel and access to cash employment (consumption measures) and whether water was available inside the house or compound, ownership of radio, television, and motorvehicle (wealth measures).
The community services index includes the following variables: availability of schools, clinics, market, police, paved road, and cellular phone reception in the enumeration area.
The crime index includes the following variables: frequency of robberies in the past year, frequency of attacks in the past year, and fear of crime (0-4).

The perception of government index includes the following variables: 1-4 assessment of the government's job in addressing poverty, income inequality, crime, health and food security.
Minority language is coded one for those who speak a language at home that spoken by less than 10% of population.
Schooling is divided into four categories: no formal schooling (category includes Koranic or other informal schooling); some or finished primary school; some or finished secondary school; any post secondary education, including certificate programs.

Table 3.4: Descriptive Statistics for Rural Residents

Variable	Obs	Mean	Std. Dev.	Min	Max
Subjective wellbeing (1-5)	8869	2.666	1.018	1	5
Sociodemographic Measures					
Female = 1	9146	0.500	0.500	0	1
Age	9083	36.121	13.939	18	110
Age squared	9083	1499.011	1226.970	324	12100
Education category (0-3)	9133	1.247	0.920	0	3
Minority language = 1	9143	0.447	0.497	0	1
Religiosity (1-4)	8983	3.804	0.562	1	4
Frequency of listening to radio news	9139	1.378	0.737	0	2
Consumption wealth index	8966	-0.071	1.142	-2.580	4.120
Perception of government index	8477	-1.108	1.777	-3.956	3.901
Access to community services index	8956	-1.109	1.582	-3.917	1.773
Experience and fear of crime index	9104	-0.258	1.189	-1.095	6.656
Reference Group Characteristics					
% of under 2s wasted for reference group	9146	0.193	0.048	0.124	0.285
Mean consumption wealth	9146	-0.663	0.444	-0.800	0.799
Mean community services	9146	-01.105	0.613	-2.421	0.004
Mean crime and fear of crime	9146	-0.257	0.231	-0.633	0.530
Consumption wealth Gini	9146	0.434	0.044	0.350	0.498
Community services Gini	9146	0.192	0.059	0.045	0.257
Crime and fear of crime Gini	9146	0.440	0.039	0.387	0.532
National Level Controls					
National Gini	9146	46.978	9.535	36.500	73.900
Country GDP growth rate	9146	4.645	4.106	-8.174	7.826

Table 3.5: Descriptive Statistics for Urban Residents

Variable	Obs	Mean	Std. Dev.	Min	Max
Subjective wellbeing (1-5)	4998	3.084	1.048	1	5
Sociodemographic Measures					
Female = 1	5145	0.500	0.500	0	1
Age	5124	33.282	12.859	18	98
Age squared	5124	1273.025	1069.818	324	9604
Education category (0-3)	5135	1.782	0.919	0	3
Minority language = 1	5145	0.350	0.477	0	1
Religiosity (1-4)	5053	3.847	0.502	1	4
Frequency of listening to radio news	5142	1.539	0.644	0	2
Consumption wealth index	5026	0.904	1.259	-2.580	4.251
Perception of government index	4794	-1.040	1.831	-3.956	3.901
Access to community services index	5145	0.761	0.112	0.575	0.907
Experience and fear of crime index	5073	0.373	1.477	-3.917	1.773
Reference Group Characteristics					
% of under 2s wasted for reference group	5145	0.142	0.035	0.094	0.210
Mean consumption wealth	5145	0.906	0.421	0.024	1.397
Mean community services	5145	0.377	0.738	-1.387	1.546
Mean crime and fear of crime	5145	-0.123	0.207	-0.409	0.274
Consumption wealth Gini	5145	0.356	0.040	0.305	0.435
Community services Gini	5145	0.170	0.031	0.092	0.214
Crime and fear of crime Gini	5145	0.429	0.018	0.404	0.463
National Level Controls					
National Gini	5145	46.736	9.664	36.500	73.900
Country GDP growth rate	5145	4.321	4.052	-8.174	7.826

Table 3.6: Ordered logit estimates of subjective wellbeing (1=much worse off … 5 = much better off)

Models	1 Initial model	2 Community attributes model	3 Community attributes and relative deprivation	4 Community attributes and inequality model
Sociodemographic Characteristics				
Female = 1	0.0961**	0.111***	0.111***	0.112***
	(0.038)	(0.040)	(0.040)	(0.040)
Age	-0.0390***	-0.0356***	-0.0358***	-0.0354***
	(0.007)	(0.008)	(0.008)	(0.008)
Age squared	0.000374***	0.000344***	0.000346***	0.000341***
	(0.000)	(0.000)	(0.000)	(0.000)
Primary school (some or completed)	0.0232	0.0288	0.0331	0.0553
	(0.057)	(0.061)	(0.061)	(0.061)
Secondary school (some or completed)	0.426***	0.449***	0.452***	0.461***
	(0.061)	(0.065)	(0.066)	(0.066)
Post secondary school	0.719***	0.750***	0.751***	0.767***
	(0.079)	(0.083)	(0.084)	(0.084)
Minority language = 1	-0.0932**	-0.129***	-0.134***	-0.123***
	(0.040)	(0.042)	(0.042)	(0.042)
Religion is not very important	0.306	0.327*	0.325*	0.309
	(0.187)	(0.193)	(0.194)	(0.194)
Religion is somewhat important	0.243	0.182	0.182	0.173
	(0.152)	(0.156)	(0.156)	(0.156)
Religion is very important	0.222	0.185	0.186	0.173
	(0.143)	(0.147)	(0.147)	(0.146)
Listen to radio news between monthly and few times a week	0.229***	0.239***	0.242***	0.225***
	(0.062)	(0.067)	(0.067)	(0.067)
Listen to radio news daily	0.302***	0.309***	0.314***	0.297***
	(0.063)	(0.067)	(0.067)	(0.067)
Consumption wealth index	0.240***	0.232***	0.231***	-0.0376
	(0.018)	(0.019)	(0.020)	(0.131)
Perception of government index		0.226***	0.227***	0.227***
		(0.012)	(0.012)	(0.012)
Access to community services index		0.0155	0.0192	-0.0185
		(0.014)	(0.014)	(0.038)
Experience and fear of crime index		-0.105***	-0.104***	-0.283
		(0.018)	(0.018)	(0.196)

Reference group				
% of under 2s wasted in reference group		-2.372	-2.834	-5.224***
		(1.537)	(1.791)	(1.748)
Leave-out mean consumption wealth			0.172	
			(0.146)	
Leave-out mean community services			-0.145	
			(0.091)	
Leave-out mean crime and fear of crime			-0.399	
			(0.308)	
Reference-group consumption wealth gini				-0.772
				(1.358)
Reference-group community services gini				-1.525
				(1.197)
Reference-group crime and fear of crime gini				4.436***
				(1.462)
Interactions (contingent effects)				
Interaction of consumption wealth gini and index				0.671**
				(0.323)
Interaction of community services gini and index				0.192
				(0.204)
Interaction of crime gini and index				0.412
				(0.441)
National Level Controls				
National Gini	0.000	0.007	0.009	-0.002
	(0.006)	(0.008)	(0.010)	(0.009)
Country GDP growth rate	-0.008	0.0294***	0.012	0.0504***
	(0.009)	(0.010)	(0.012)	(0.011)
Urban = 1	0.197***	0.112	0.216	-0.028
	(0.044)	(0.096)	(0.150)	(0.122)
Ghana	0.420***	0.0999	0.0446	-0.126
	(0.081)	(0.092)	(0.108)	(0.115)
Kenya	-0.645***	-0.679***	-0.617***	-0.917***
	(0.085)	(0.108)	(0.144)	(0.119)
Liberia	0.866***	0.998***	1.061***	1.191***
	(0.084)	(0.104)	(0.205)	(0.120)
Mali	0.319***	0.575***	0.539***	0.197
	(0.061)	(0.156)	(0.178)	(0.172)
Namibia	0.0526	-0.433	-0.531*	-0.343

	(0.209)	(0.271)	(0.314)	(0.310)
Nigeria	0.206***	0.247**	0.370***	0.320*
	(0.077)	(0.122)	(0.138)	(0.165)
Uganda	-0.393***	-0.500***	-0.246	-0.471***
	(0.087)	(0.109)	(0.185)	(0.170)
Constant cut1	-2.240***	-2.475***	-2.221***	-2.077*
	(0.342)	(0.614)	(0.764)	(1.204)
Constant cut2	-0.412	-0.584	-0.329	-0.183
	(0.342)	(0.614)	(0.764)	(1.203)
Constant cut3	1.101***	0.985	1.241	1.388
	(0.342)	(0.615)	(0.764)	(1.203)
Constant cut4	3.364***	3.269***	3.525***	3.677***
	(0.343)	(0.615)	(0.762)	(1.205)
Observations	13,273	12,164	12,164	12,164
Pseudo R-squared	0.0452	0.0628	0.063	0.0637
Akaike Information Criterion	2.311	2.266	2.266	2.265

Notes:
*** indicates statistical significance at the 1% level; ** at the 5% level; * at the 10% level
To create community characteristics, I divide the country into rural and urban areas and compute community level characteristics based on either rural or urban information.
The consumption wealth index, the community services index, the crime index, and the perception of government index are the first scores generated from a principal components analysis for each country.
The consumption wealth index includes the following variables: past year's frequency of adequate availability of food, cash, water, medical care, and fuel and access to cash employment (consumption measures) and whether water was available inside the house or compound, ownership of radio, television, and motorvehicle (wealth measures).
The community services index includes the following variables: availability of schools, clinics, market, police, paved road, and cellular phone reception in the enumeration area.
The crime index includes the following variables: frequency of robberies in the past year, frequency of attacks in the past year, and fear of crime (0-4).
The perception of government index includes the following variables: 1-4 assessment of the government's job in addressing poverty, income inequality, crime, health and food security.
Minority language is coded one for those who speak a language at home that spoken by less than 10% of population.
Schooling is divided into four categories: no formal schooling (category includes Koranic or other informal schooling); some or finished primary school; some or finished secondary school; any post secondary education, including certificate programs.
Leave-out mean consumption wealth, leave-out mean community services, and leave-out mean crime risk were all calculated as the reference group mean, excluding the contribution of the respondent's value to the average.
Benin, Zambia and Zimbabwe are the excluded countries.
Excluded category for religion is "religion is not at all important".
Excluded category for listen to the radio is "listen less than monthly".

Table 3.7: Predicted values of subjective wellbeing

SWB level	Descriptive Statistics	Model 1	Model 2	Model 3	Model 4
1	0.1091	0.0916	0.0858	0.0857	0.0854
2	0.2892	0.2939	0.2977	0.2977	0.2974
3	0.3194	0.3546	0.3657	0.3659	0.3663
4	0.2406	0.2246	0.2177	0.2177	0.2180
5	0.0417	0.0352	0.0330	0.0330	0.0329
# of respondents	13,867	13,273	12,164	12,164	12,164

Table 3.8: Average marginal effect of the consumption-wealth Gini evaluated at different values of the consumption-wealth index

C-W index value	SWB = 1	SWB = 2	SWB = 3	SWB = 4	SWB = 5
-1.5	0.205	0.191	-0.129	-0.219	-0.048
	(0.171)	(0.160)	(0.106)	(0.184)	(0.041)
-1	0.154	0.166	-0.091	-0.186	-0.043
	(0.152)	(0.164)	(0.088)	(0.185)	(0.044)
-0.5	0.109	0.135	-0.058	-0.149	-0.037
	(0.136)	(0.168)	(0.071)	(0.186)	(0.046)
0	0.070	0.098	-0.031	-0.108	-0.029
	(0.123)	(0.172)	(0.054)	(0.189)	(0.050)
0.5	0.036	0.057	-0.012	-0.063	-0.018
	(0.112)	(0.175)	(0.038)	(0.194)	(0.055)
1	0.008	0.013	-0.002	-0.015	-0.005
	(0.103)	(0.180)	(0.020)	(0.201)	(0.061)
1.5	-0.016	-0.031	0.000	0.035	0.012
	(0.096)	(0.185)	(0.002)	(0.209)	(0.069)
2	-0.036	-0.075	-0.007	0.086	0.031
	(0.090)	(0.190)	(0.018)	(0.219)	(0.079)
2.5	-0.051	-0.118	-0.023	0.138	0.055
	(0.084)	(0.196)	(0.040)	(0.229)	(0.091)

Table 3.9: Average marginal effect of the consumption-wealth index evaluated at different values of consumption-wealth Gini

Community	Gini	SWB = 1		SWB = 2		SWB = 3		SWB = 4		SWB = 5	
Urban Nigeria	0.305	-0.014	***	-0.021	***	0.004		0.024	***	0.007	***
		(0.004)		(0.004)		(0.003)		(0.005)		(0.002)	
Urban Kenya	0.317	-0.015	***	-0.022	***	0.005	*	0.025	***	0.007	***
		(0.004)		(0.004)		(0.003)		(0.005)		(0.002)	
Urb Zimbabwe	0.322	-0.015	***	-0.022	***	0.005	**	0.025	***	0.008	***
		(0.003)		(0.004)		(0.002)		(0.004)		(0.001)	
Urban Zambia	0.347	-0.017	***	-0.024	***	0.005	***	0.027	***	0.008	***
		(0.003)		(0.003)		(0.002)		(0.004)		(0.001)	
Rural Nigeria	0.350	-0.017	***	-0.024	***	0.006	***	0.027	***	0.008	***
		(0.003)		(0.003)		(0.002)		(0.003)		(0.001)	
Urban Ghana	0.357	-0.017	***	-0.025	***	0.006	***	0.028	***	0.008	***
		(0.003)		(0.003)		(0.002)		(0.003)		(0.001)	
Urban Namibia	0.362	-0.018	***	-0.025	***	0.006	***	0.028	***	0.009	***
		(0.003)		(0.003)		(0.002)		(0.003)		(0.001)	
Urban Benin	0.382	-0.019	***	-0.027	***	0.007	***	0.030	***	0.009	***
		(0.002)		(0.002)		(0.001)		(0.003)		(0.001)	
Urban Uganda	0.384	-0.019	***	-0.027	***	0.007	***	0.030	***	0.009	***
		(0.002)		(0.002)		(0.001)		(0.003)		(0.001)	
Urban Mali	0.385	-0.019	***	-0.027	***	0.007	***	0.030	***	0.009	***
		(0.002)		(0.002)		(0.001)		(0.003)		(0.001)	
Rural Ghana	0.406	-0.021	***	-0.028	***	0.007	***	0.032	***	0.010	***
		(0.002)		(0.002)		(0.001)		(0.003)		(0.001)	
Rural Kenya	0.419	-0.022	***	-0.029	***	0.008	***	0.033	***	0.010	***
		(0.002)		(0.002)		(0.001)		(0.003)		(0.001)	
Rural Zambia	0.420	-0.022	***	-0.029	***	0.008	***	0.033	***	0.010	***
		(0.002)		(0.002)		(0.001)		(0.003)		(0.001)	
Rural Liberia	0.428	-0.022	***	-0.030	***	0.008	***	0.034	***	0.010	***
		(0.002)		(0.003)		(0.001)		(0.003)		(0.001)	
Rural Benin	0.434	-0.023	***	-0.030	***	0.008	***	0.034	***	0.010	***
		(0.002)		(0.003)		(0.001)		(0.003)		(0.001)	
Urban Liberia	0.435	-0.023	***	-0.030	***	0.008	***	0.035	***	0.010	***

		(0.002)		(0.003)		(0.001)		(0.003)		(0.001)	
Rural Mali	0.443	-0.023	***	-0.031	***	0.008	***	0.035	***	0.011	***
		(0.002)		(0.003)		(0.001)		(0.003)		(0.001)	
Rural Namibia	0.444	-0.024	***	-0.031	***	0.009	***	0.035	***	0.011	***
		(0.002)		(0.003)		(0.001)		(0.003)		(0.001)	
Rur Zimbabwe	0.446	-0.024	***	-0.031	***	0.009	***	0.035	***	0.011	***
		(0.002)		(0.003)		(0.002)		(0.003)		(0.001)	
Rural Uganda	0.498	-0.028	***	-0.034	***	0.010	***	0.039	***	0.012	***
		(0.004)		(0.004)		(0.004)		(0.005)		(0.002)	

Table 3.10: Average marginal effect of the crime risk Gini evaluated at different values of the crime risk index

Crime index value	SWB = 1		SWB = 2		SWB = 3		SWB = 4		SWB = 5	
-1.095	-0.336	***	-0.486	***	0.094	**	0.553	***	0.175	***
	(0.127)		(0.182)		(0.037)		(0.208)		(0.066)	
-0.341	-0.382	***	-0.516	***	0.134	***	0.588	***	0.176	***
	(0.130)		(0.174)		(0.046)		(0.199)		(0.060)	
-0.002	-0.404	***	-0.528	***	0.153	***	0.603	***	0.176	***
	(0.134)		(0.174)		(0.051)		(0.199)		(0.059)	
0.336	-0.427	***	-0.539	***	0.173	***	0.617	***	0.177	***
	(0.139)		(0.175)		(0.057)		(0.200)		(0.058)	
0.843	-0.463	***	-0.555	***	0.204	***	0.637	***	0.176	***
	(0.150)		(0.179)		(0.067)		(0.206)		(0.057)	
1.090	-0.481	***	-0.561	***	0.220	***	0.646	***	0.176	***
	(0.157)		(0.182)		(0.073)		(0.210)		(0.057)	
1.428	-0.506	***	-0.570	***	0.242	***	0.658	***	0.176	***
	(0.167)		(0.187)		(0.081)		(0.216)		(0.058)	
1.844	-0.538	***	-0.579	***	0.270	***	0.672	***	0.175	***
	(0.182)		(0.194)		(0.093)		(0.225)		(0.059)	
2.521	-0.593	***	-0.590	***	0.317	***	0.693	***	0.173	***
	(0.210)		(0.207)		(0.115)		(0.243)		(0.061)	
3.119	-0.644	***	-0.596	***	0.360	***	0.709	***	0.171	***
	(0.240)		(0.219)		(0.137)		(0.261)		(0.063)	

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APPENDIX 3.1

DATA AND VARIABLE DESCRIPTION, IMPUTATION, AND ROBUSTNESS CHECKS

Data and Variable Description

Below, I describe Afrobarometer data, Demographic and Health Services data, and other datasets that I combined to create a unique dataset with which to evaluate the roles of different forms of inequality on respondents' subjective wellbeing.

Afrobarometer Round 4

Afrobarometer is a survey of voting-age citizens' attitudes on the quality of democracy and governance in their countries.[24] In 2008-9, the fourth round of Afrobarometer was fielded in twenty African countries. In all but two countries, 1200 individuals over the age of 18 were sampled (2400 individuals were sampled in Nigeria and South Africa). Response rates tend to be quite high. Among the questions of interest, no one refused to answer these questions, and combined rates of "missing" and "don't know" responses were less than seven percent of the total sample. Imputation is discussed further below.

Afrobarometer uses probability proportionate to population sample (Afrobarometer 2008). First, it stratifies the sample by region / province and by urban or rural. Then, it clusters eight interviews within each primary sampling unit, which is identified using census enumeration areas. In total, 150 primary sampling units are used in countries with 1200 interviews and 300 units are used in countries with 2400 interviews. These 150 (300) units are allocated across the strata based on the population

[24] Information on Afrobarometer sampling methods is drawn from here: http://www.afrobarometer.org/survey-and-methods/sampling-principals

proportion. Data are weighted within countries to account for any oversampling and across countries so that samples sizes are the same across countries.

Approximately two-thirds of the Afrobarometer questions are identical across surveys. The other one-third focus on current political issues or policies of interest to the specific country. The questions that are identical across countries and useful for the models include basic demographic attributes, location information, sense of security, community services, inability to meet basic consumption needs, assets owned, religiosity, and technology use.

As with many surveys in developing countries, Afrobarometer relies on national probability samples in order to generate a sample that is representative in the cross-section of all citizens of voting age. However, in many countries, nationally representative surveys are quite outdates and the demographic patterns necessary to extrapolate an updated sample are not available. This is particularly likely to be a problem in countries experiencing heavy rural-to-urban migration or seasonal migration patterns. Older national samples may indicate lower urban populations than is currently the case. Further, when countries experience conflict or insecurity, certain areas may not be surveyed, either because there is no national probability sample to draw from or because it is deemed unsafe to send enumerator teams. During Round 4, northern Uganda was not included due to security concerns.

Demographic and Health Survey Round 5

The Demographic and Health Survey (DHS) data include both questions standardized across countries and questions that are country-specific (DHS Recode File version 1.0, 2008) but focuses on gathering information on maternal and child health, as

well as other basic demographic information and limited wealth and asset information. In order to improve recall about maternal and child health, DHS enumerators elicit information from a female member of the household. Approximately 5000 to 6000 women and their households are interviewed per country. Response rates for the DHS tend to be extremely high – between 92 and 97 percent (Vaessen 2005).[25]

Each DHS sampling frame is slightly different, although most use the same general approach. First, previous censuses or population counts are used to identify primary sampling units (PSUs). PSUs are sampled with probability proportional to population (or number of households). Most DHS surveys use geographic stratification, including rural/urban stratum and or regional stratum. In each stratum, the PSUs are selected independently. After the PSUs are selected, if the sampling frame is current, households are sampled randomly from within the PSU (Vaessen 2005). If the sampling frame is out of date, a list of households within each PSU is generated and then households are randomly selected. Within each selected PSU, respondents are randomly selected, with cluster of 30-40 women in rural areas and 20-25 women in urban areas.

To take one example, the 2008 DHS uses the 2000 Ghanaian census as a master sampling frame to identify the number of people to sample within each province and within urban and rural areas within province. 412 clusters were selected from the sampling frame using systematic sampling with probability proportional to size and 30 households were selected using systematic sampling in each cluster (Ghana Statistical

[25] The most recently available census for Liberia was undertaken in 1984, prior to its civil war, which resulted in massive internal migration and resettlement. Macro International, the implementers of DHS, used a 2005 population projection to identify the population by enumeration areas (for more information, see DHS Country report for Liberia, Round 5; Appendix A p. 253-255).

Service et al. 2009). The Ghana sample is nationally representative, but does rely on an outdated census.

When relying on outdated population measures and where reliable estimates exist, sample weights also incorporate expected growth rates for particular populations. The DHS data need to be reweighed to be representative, as DHS does oversample in small geographic areas with small percentages of the population.

A possible (but unknown result) of using an outdated census is that the Ghana DHS survey may fail to sample women and their households from the margins of urban areas, which were not necessarily urban areas in 2000. It is possible that poorer households are at the margins of urban areas and therefore it is prudent to assume that some under-representation of the poorest and poor urban residents may exist. However, Rutstein (2008) argues that the poorer urban households may still be better off than rural households: "In reality, the households in the lower urban-defined quintiles may be wealthier than households in any of the rural-defined quintiles, since in most developing countries most people in poorer urban areas and slums are better off than most people in rural areas" (p. 11).[26] If this is the case, the survey may be more balanced.[27]

Income Inequality Gini Coefficients and Gross Domestic Product

To measure changes in national income inequality over time, I use estimates compiled by Milanovic (2010) that includes Gini coefficients from five sources. It

[26] http://www.measuredhs.com/pubs/pdf/WP60/WP60.pdf

[27] A second, related concern is that recent migrants to urban communities may be using people in urban areas may be using rural communities as their (implicit) reference groups, even though the question is asks that the country be the referent. I cannot control for individuals' different interpretations of survey questions, although we expect that if this is happening it is occurring consistently across nations.

includes information from World Institute for Development Research (WIDER)'s World Income Inequality Database (WIID), which has subsumed Deininger and Squire's database, and from the World Income Database (WYD). Since it was introduced, the Deininger and Squire database has dominated cross-national inequality studies (Atkinson and Brandolini (2006) review 27 studies using macroeconomic variables to look at inequality of the income distribution pp 402-413). However, Milanovic argues that data from WYD, included in the All the Ginis database, is preferable to data from WIDER's 2008 WIID2 database because WYD computes Ginis from micro-level data. (http://www.wider.unu.edu/research/Database/en_GB/database/) . Unfortunately, as discussed above, in some countries, for example, Liberia only extremely outdated Gini estimates are available.

I also use data from the World Bank to compute a simple average of the gross domestic product for the five years 2002-2006 (http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG/countries).

Weighting

The Afrobarometer data were weighted across and within country to adjust for failures to sample from certain population units. These weights were computed using the most currently available census data. Similarly, DHS data files are pre-weighted to adjust for any oversampling of particular populations (e.g., urban residents).

According to the DHS III sampling manual (1996), sample sizes are large enough to allow for "five or six geographic areas to be distinguished in the tabulation of key variables" (p. 2). In countries with urban populations less than 20 percent, there is oversampling in urban areas in order to ensure urban populations are adequately

represented.

Imputation

Prior to estimating the correlates of subjective wellbeing, and after combining the ten DHS community averaged datasets with the Afrobarometer data and creating the variables needed for the models, I used chained multiple imputation to estimate "missing" and "don't know" responses in the Afrobarometer data. Missing values and don't know responses can be arbitrary or systematic (e.g., a particular subpopulation may find a certain question sensitive and refuse to answer it). When variables are missing at random (MAR) (that is, missingness depends on the observed data), then analyzing the sample of complete cases can give biased results while analyzing a sample with imputed data will not be biased. Under the MAR assumption, the probability that a value is missing does not depend on the true value for that case after controlling for observed variables.

Each Afrobarometer question allows respondents to reply "don't know" or "refused to answer" or "missing." Among the questions included in my model, no one responded "refused to answer." I treat these responses as the same.[28] Examining the Afrobarometer data, I found no observable patterns of missingness among variables missing values. In a nested table, I did not find instances of monotone missing values (where a missing value in variable x means that variable y will also have a missing value).

[28] For all of the missing values, it is likely that the data are missing at random. For almost all of the "don't knows" responses, data are also likely to be random. However, it could be valuable to differentiate between missing and "don't know" responses because some variables are likely missing data not at random. Older people may be less likely to know precisely their age. People who feel destitute and feel ashamed may refuse to answer a question about food availability rather than admit that they went hungry.

The total sample across the ten countries included 14,291 respondents. The table below shows the fourteen variables that have missing information and that I intend to include in the estimation models. The amount of missing data varies by question. For example, only three respondents failed to report the language spoke at home, which was used to generate the minority language variable. However, the government perception index, which was created using series of questions about whether a government is doing a good job regarding different social issues, is missing responses from 7 percent of the interviewed households. The overall degree of missingness is quite small compared to other surveys and I expect imputed results to be consistent with results from a complete case analysis.

Table 3A.1: Variables with missing observations to be imputed

	Obs.	Mean	Std. Dev.	Min.	Max.
Subjective Wellbeing	13867	2.817	1.049	1	5
Age	14207	35.097	13.628	18	110
Age squared	14207	1417.505	1177.693	324	12100
Education category (0-3)	14268	1.439	0.955	0	3
Minority language = 1	14288	0.412	0.492	0	1
Religiosity (1-4)	14036	3.819	0.542	1	4
Frequency of listening to radio news	14281	1.436	0.709	0	2
Consumption wealth index	13992	0.279	1.274	-2.58	4.25
Perception of government index	13271	-1.084	1.797	-3.96	3.90
Access to community services index	14029	-0.573	1.701	-3.92	1.77
Experience and fear of crime index	14215	-0.209	1.213	-1.09	6.66
Interaction of consumption wealth Gini and index	13992	0.082	0.501	-1.29	1.80
Interaction of community services Gini and index	14029	-0.117	0.334	-1.01	0.46
Interaction of crime Gini and index	14215	-0.093	0.532	-0.58	3.54

I then ran logit models to predict missingness (having created indicators of missingness) based on the observations in my sample. Below, I present findings from one logit estimate and one t-test estimation to demonstrate that other variables in my model predict whether a given variable is missing. I then run t-tests to determine whether values

of the other variables vary by missingness, finding that some variables do vary missingness group. I do not present all the findings, because the below estimation is adequate to demonstrate that proceeding with multiple imputation is appropriate. Note that variables constructed using DHS data were collinear with the interaction of country and community (urban or rural) and were omitted in the model.

Table 3A.2: Logit Estimate of Missingness of Consumption – Wealth Index

	Coef.	Std. Err.
Other imputed variables		
Perception of government index	0.001	0.042
Access to community services index	0.127*	0.065
Experience and fear of crime index	0.029	0.059
Age	-0.005	0.006
Minority language = 1	0.048	0.155
Primary school (some or completed)	-0.363	0.236
Secondary school (some or completed)	0.020	0.223
Post secondary school	-0.387	0.289
SWB = 2	-0.520	0.277
SWB = 3	0.200	0.249
SWB = 4	0.123	0.260
SWB = 5	0.164	0.385
Listen to radio news between monthly and few times a week	-0.602**	0.234
Listen to radio news daily	-0.658***	0.224
Religion is not very important	0.289	0.878
Religion is somewhat important	0.111	0.778
Religion is very important	0.400	0.721
Variables with no missing values		
Female ==1	-0.170	0.149
Paved Road ==1	-0.104	0.197
Electricity Access ==1	-0.210	0.218
Benin	0.541	0.617
Ghana	1.193**	0.575
Kenya	1.200*	0.640
Liberia	-0.007	0.671
Mali	1.029*	0.621
Nigeria	0.755	0.552
Uganda	-1.479	1.122
Zambia	-0.023	0.720
Zimbabwe	0.498	0.643
Urban Benin	-0.397	0.558
Rural Ghana	-0.133	0.413
Rural Kenya	-0.586	0.505
Rural Liberia	1.015**	0.488
Rural Mali	-1.169	0.878

Rural Nigeria	0.721***	0.274
Rural Uganda	1.475	1.044
Rural Zambia	0.139	0.651
Rural Zimbabwe	-0.753	0.613
Constant	-3.822***	0.981

The model indicates that listening to radio news is statistically significantly negatively correlated with missing information on wealth and consumption measures.

A two-sample t-test of the community services index by missingness of the consumption wealth index indicates that mean values of community services when the consumption wealth index is missing and when it is not are statistically significantly different at the one percent level. The findings regarding the missingness of the consumption wealth index, among others, demonstrate that missingness of at least some variables can be predicted by other variables in the sample. Thus, the data appear to be missing at random rather than missing completely at random.

Table 3A.3: Two-sample t-test of community services by missingness of consumption-wealth (c-w) index with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Cases not missing c-w index	13736	-0.5840	0.0145	1.700439	-0.612	-0.556
Cases missing c-w index	293	-0.0448	0.0967	1.65545	-0.235	0.146
Combined	14029	-0.5728	0.0144	1.701202	-0.601	-0.545
Difference		-0.5392	0.1003		-0.736	-0.343
diff = 'mean(0) -'mean(1)					t=	-5.374
Ho: diff = 0					degrees of freedom	14027
Ha: diff < 0	Pr(T < t) =0.00					
Ha: diff!=0	Pr(|T| > |t|) =0.00					
Ha: diff > 0	Pr(T>t) = 1.00					

I multiply imputed the missing values by estimating those values as a function of the other predictors (and the dependent variable) in the model. Unlike mean imputation or conditional mean imputation, multiply imputed values are drawn from a distribution. As a result, values contain some variation and are not error free. A multiply imputed parameter is the mean of estimates across imputations. When a model includes well-estimated

multiply imputed values, it should have less bias than in the complete case analysis model.

After the multiple imputation, I deleted all imputed responses of the dependent variable. I included the subjective wellbeing dependent variable in the imputation to allow for the correct specification of the imputed model but remove the missing cases before undertaking the analysis, although given the small number of missing values, deletion may not have been necessary (Johnson and Young 2011). The 14 imputed variables (see table above) included both continuous and discrete responses. Therefore, I used chained multiple imputation to account for these multiple types of variables.

Following Johnson and Young's 2011 survey of imputation approaches in which they argue that the imputation model should include at least the same set of variables as the analysis model, I included all variables that I later include in the estimation models as well as a few relevant auxiliary variables (electricity access and access to paved road). Variables without missing values that were also included in the imputation included all of the DHS health-related data, sex of the respondent, and location. Failing to include variables in the imputation model that are later used in the analysis model results in underestimated covariances. The variable included in the analysis model but not included in the imputation model will be uncorrelated with the imputed values. Thus, I also include the interaction terms. Failing to do so and calculating these terms after an imputation can lead to biased results (von Hippel 2009, as cited by Johnson and Young 2011). Again following Johnson and Young (2011), I generated five datasets. Combining results from these imputations into the later analyses allows me to account for the uncertainty resulting from any individual imputation.

The chained multiple imputation model suffers from the problem of perfect prediction. Perfect prediction can result from inclusion of many factor variables, and is not uncommon. In STATA, including the option "augment", forces the imputation to use an augmented regression that adds low-weighted observations to the dataset in order to disrupt the perfect prediction while having a negligible effect on the results.

After examining imputed values from each imputation for anomalous results, Iaverage results from the five imputations into one set of results in the table below. We also examined frequencies of non-continuous variables, to ensure that distributions were similar to the complete case distributions. Comparing the imputed values to means and standard deviations from the complete case analysis, I find that for most variables the two sets of values are consistent, and within range of one another, although not identical.

Table 3A.4: Comparing means and standard deviations between complete cases and imputed values

	Complete Cases			Imputed Values		
	Obs.	**Mean**	**Std. Dev.**	**Obs.**	**Mean**	**Std. Dev.**
Age	14207	35.097	13.628	84	39.558	13.745
Age squared	14207	1417.505	1177.693	84	1806.464	1219.624
Education category (0-3)	14268	1.439	0.955	23	1.487	0.945
Minority language = 1	14288	0.412	0.492	3	0.600	0.577
Religiosity (1-4)	14036	3.819	0.542	255	3.810	0.575
Frequency of listening to radio news	14281	1.436	0.709	10	1.080	0.827
Consumption wealth index	13992	0.279	1.274	299	0.469	1.291
Perception of government index	13271	-1.084	1.797	1020	-0.779	1.801
Access to community services index	14029	-0.573	1.701	262	0.585	-1.801
Experience and fear of crime index	14215	-0.209	1.213	76	-0.084	1.282
Interaction of consumption wealth Gini and index	13992	0.082	0.501	299	0.148	0.509
Interaction of community services Gini and index	14029	-0.117	0.334	262	-0.122	0.352
Interaction of crime Gini and index	14215	-0.093	0.532	76	-0.039	0.564

The most important difference is that the mean index measures vary substantially between the imputed values and the complete case values. The mean community services index is estimated to be much higher for those with missing values, compared to the

mean from the complete case analysis. Mean imputed estimates of the other index measures are also higher than mean estimates from the complete case analysis. The crime index and the perception of government index are both less negative for imputed values and the mean consumption-wealth index is nearly double for the imputed values. These higher mean indices would suggest that respondents missing information on the variables included in the indices tend to be better off, in terms of wealth, consumption, and/or community services than other respondents. However, I have no evidence to confirm that this is the case.

With the caveat in mind that the imputed indices tend to be higher than the indices with complete case information, I estimate the models. I find that the imputation models' results are consistent with results from the complete case models. The imputed models' coefficients are neither consistently higher nor lower than the coefficients of the complete case models. There are two noticeable differences regarding statistical significance. In model 2, the imputed data yield a wasting measure that is statistically significant at ten percent, while wasting is not as significant in the complete case analysis model. In imputed model 3, the interaction term between the consumption-wealth measure and its Gini is statistically significant at the one percent level, but significant at the five percent level in the complete case model.

Table 3A.5: Ordered logit estimates of subjective wellbeing using data generated by chained multiple imputation

VARIABLES	(1) Initial model	(2) Community attributes model	(3) Community attributes and inequality model
Sociodemographic Measures			
Female = 1	0.0922**	0.0933**	0.0948**
	(0.0379)	(0.0382)	(0.0381)
Age	-0.0375***	-0.0346***	-0.0346***
	(0.0071)	(0.0072)	(0.0071)
Age squared	0.0004***	`0.0003***	0.0003***
	(0.0001)	(0.0001)	(0.0001)
Primary school (some or completed)	0.0283	0.0416	0.0637
	(0.0562)	(0.0569)	(0.0577)
Secondary school (some or completed)	0.4194***	0.4384***	0.4469***
	(0.0603)	(0.0611)	(0.0618)
Post secondary school	0.7100***	`0.7429***	0.7601***
	(0.0780)	(0.0789)	(0.0792)
Minority language = 1	-0.0805**	-0.1082***	-0.1029***
	(0.0391)	(0.0394)	(0.0394)
Religion is not very important	0.34056*	0.3290*	0.3125*
	(0.1823)	(0.1809)	(0.1811)
Religion is somewhat important	0.2509*	0.1911	0.1831
	(0.1469)	(0.1444)	(0.1442)
Religion is very important	0.2365*	0.1852	0.1735
	(0.1378)	(0.1351)	(0.1348)
Listen to radio news between monthly and few times a week	0.2497***	0.2307***	0.2154***
	(0.0617)	(0.0625)	(0.0626)
Listen to radio news daily	0.3209***	0.2983***	0.2835***
	(0.0621)	(0.0628)	(0.0628)
Consumption wealth index	0.2362***	0.2293***	-0.1106
	(0.0184)	(0.0187)	(0.1246)
Perception of government index		0.2245***	0.2247***
		(0.0118)	(0.0118)
Access to community services index		0.0172	-0.0296
		(0.0131)	(0.0362)
Experience and fear of crime index		-0.1033***	-0.2781
		(0.0169)	(0.1911)
Community Characteristics			
% of under 2s wasted for community		-2.6875*	-5.2227***
		(1.4624)	(1.6466)
Community-level consumption wealth Gini			-1.0199
			(1.2725)
Community-level community services Gini			-1.2878
			(1.1329)
Community-level crime Gini			3.9638***
			(1.3622)
Interactions (contingent effects)			
Interaction of consumption wealth Gini and index			0.8457***

			(0.3072)
Interaction of community services Gini and index			0.2618
			(0.1949)
Interaction of crime Gini and index			0.4049
			(0.4310)
Nation Level Controls			
National Gini	-0.0008	0.0064	-0.0017
	(0.0057)	(0.0076)	(0.0089)
Country GDP growth rate	-0.0099	0.0339***	0.0512***
	(0.0085)	(0.0090)	(0.0104)
Urban = 1	0.1949***	0.0880	-0.0457
	(0.0440)	(0.0910)	(0.1175)
Ghana	0.4008***	0.0254	-0.1781*
	(0.0801)	(0.0840)	(0.1066)
Kenya	-0.6567***	-0.7197***	-0.9282***
	(0.0832)	(0.1025)	(0.1132)
Liberia	0.8613***	0.9773***	1.1631***
	(0.0832)	(0.0990)	(0.1153)
Mali	0.3019***	0.5381***	0.2024
	(0.0602)	(0.1495)	(0.1647)
Namibia	0.0844	-0.4503*	-0.3626
	(0.2066)	(0.2551)	(0.2937)
Nigeria	0.2168***	0.24578**	0.3122**
	(0.0759)	(0.1155)	(0.1532)
Uganda	-0.3994***	-0.5371***	-0.4809***
	(0.0857)	(0.1031)	(0.1628)
Constant cut1	-2.2250***	-2.5680***	-2.3466**
	(0.3372)	(0.5798)	(1.1452)
Constant cut2	-0.4024	-0.6926	-0.4683
	(0.3366)	(0.5791)	(1.1437)
Constant cut3	1.1130***	0.8717	1.0981
	(0.3370)	(0.5798)	(1.1441)
Constant cut4	3.37666***	3.1794***	3.409***
	(0.3378)	(0.5800)	(1.1461)
Observations	13,598	13,598	13,598
Number of imputations	5	5	5

Given the degree of missingness is quite low and results from the imputation are consistent with complete case analysis results, I proceed with analysis and post-estimation analysis of the complete case model. As noted by StataCorp in its 2011 STATA Multiple Imputation Handbook for version 12 of STATA when using multiple imputation, there is no one estimation sample. Rather, there are many estimation samples. StataCorp cautions "do not expect postestimation commands that depend on predicted values … to produce correct results" (2011, p. 77). The inability to reliably engage in do

post-estimation work with the imputed survey means the imputed models' explanatory power is substantially less than that of the complete case models. Thus, while using the complete case analysis with data missing at random runs the risk of biased results, the differences in the coefficient values, standard errors, and statistical significances between the complete case analysis and the imputed results are quite small.

Additional References used for Chained Multiple Imputation

University of Madison, Wisconsin – Social Science Computing Cooperative
http://www.ssc.wisc.edu/sscc/pubs/stata_mi_impute.htm
UCLA Multiple Imputation in STATA
http://www.ats.ucla.edu/stat/stata/seminars/missing_data/mi_in_stata_pt1.htm

Construction of Variables: Principal Components Analysis and Inequality Measures

Principal Components Analysis

An important component of SWB is economic wellbeing, measure as income, consumption or wealth. Failing to include economic factors would be detrimental to the models. Unfortunately, neither the Afrobarometer survey nor the DHS surveys include detailed income, wealth or consumption measures. Rather, many researchers interested in using these datasets opt for an alterative, proxy measure, such as a wealth or consumption index. Many of these indices are created using data reducing techniques, such as principal components or factor analysis, to compute a single value and to avoid needing to use "suspect price deflators and currency converters" (Sahn and Stifel 2000, p. 2123; see also Filmer and Pritchett 2001). DHS surveys include wealth factor scores calculated from a series of assets (e.g., bike ownership), access to services, and housing materials using principal components analysis. Research on the DHS wealth index, which is calculated

separately for each DHS country, finds that the DHS wealth-based index is both internally consistent and is more representative of long-term economic status than indices of consumption expenditures (Filmer and Pritchett 2001; Rutstein 2008).

Mattes, Bratton and Davids (2003) compute a *Lived Poverty Index.* The authors use six questions from Afrobarometer, including "over the past year, how often have you or your family gone without food, [water, medical treatment, cooking fuel and cash]?" Those who respond "never" are categorized as nonpoor. Those who respond "occasionally" are poor, while those responding "frequently" are very poor and or "always" are categorized as destitute. This index ranges between the values of one and four. The number one represents a complete satisfaction of basic needs while the number four represents frequent shortages of basic needs. This index is based on self-report information and does not include assets or income.

Mattes Bratton and Davids (2003) also present results validating the *Lived Poverty Index.* Ranking poverty in seven southern African countries, the authors benchmarked the *Lived Poverty Index* against several other studies, finding cross-country poverty rankings generally matched with other approaches, such as GNP, GNP PPP, and UNDP HDI (Mattes et al. 2003). However, the Afrobarometer did rank one country as the lowest while the other indices ranked an Afrobarometer's sixth poorest (of seven) as the poorest. It also measured fairly consistently with intra-country regional measures of money-based poverty in South Africa. The *Lived Poverty Index* fairs poorly when benchmarked against rankings of literacy, education or health.

Building on the *Lived Poverty Index,* I include additional information on assets and form of income, creating a consumption-wealth index that includes both wealth and

consumption measures. In addition to the measures included in the *Lived Poverty Index,* the consumption-wealth index includes Afrobarometer questions about ownership of radio, television, motorvehicle, and the form of water availability and degree of access to cash income. By combining consumption and wealth measures, I expect that the index can identify impoverished households, as the Lived Poverty Index does, as well as capture more differentiation among well-to-do households that do not regularly go without basic consumption items. Thus, including assets enables me to better differentiate among households that do not go without basic consumption items but are not so well off as to own, say, a motorvehicle, and those that are very well-off who similarly do not go without basic consumption items but who own a motorvehicle.

Following the work of Filmer and Pritchett (2001) whose wealth index created with Indian DHS data using principal components analysis has become a calculated variable included in all DHS datasets, I also used principal components analysis to summarize these variables for each country, storing the first component of the variance-covariance matrix from the PCA as each respondent's consumption-wealth index. PCA captures information covarying across the set of included variables. The first component is a "linear combination of the variables with maximum variance" (Filmer and Pritchett 2001). Sahn and Stifel (2000) argue that factor analysis is more appropriate than principal components analysis when an underlying, theoretical model is known. In this case, I do not have an underlying combined model of wealth and consumption and do no wish to impose a structural model using the very limited asset and consumption information Ihave available.

Before computing the PCA, I invert the consumption measures so that a higher

response indicates greater consumption. This makes the consumption measures consistent with the asset indicators. In order to compute Gini coefficients from the PCA scores, I also transformed the underlying variables to be nonzero and positive. This rescoring does not change the underlying meaning of the ordinal values since the ranking and distance between each value was preserved. My dependent variable asks respondents to consider their wellbeing relative to other citizens in their country. Therefore, I predict the first component by country, so that the index score for each respondent is relative to other citizen-respondents in their country.

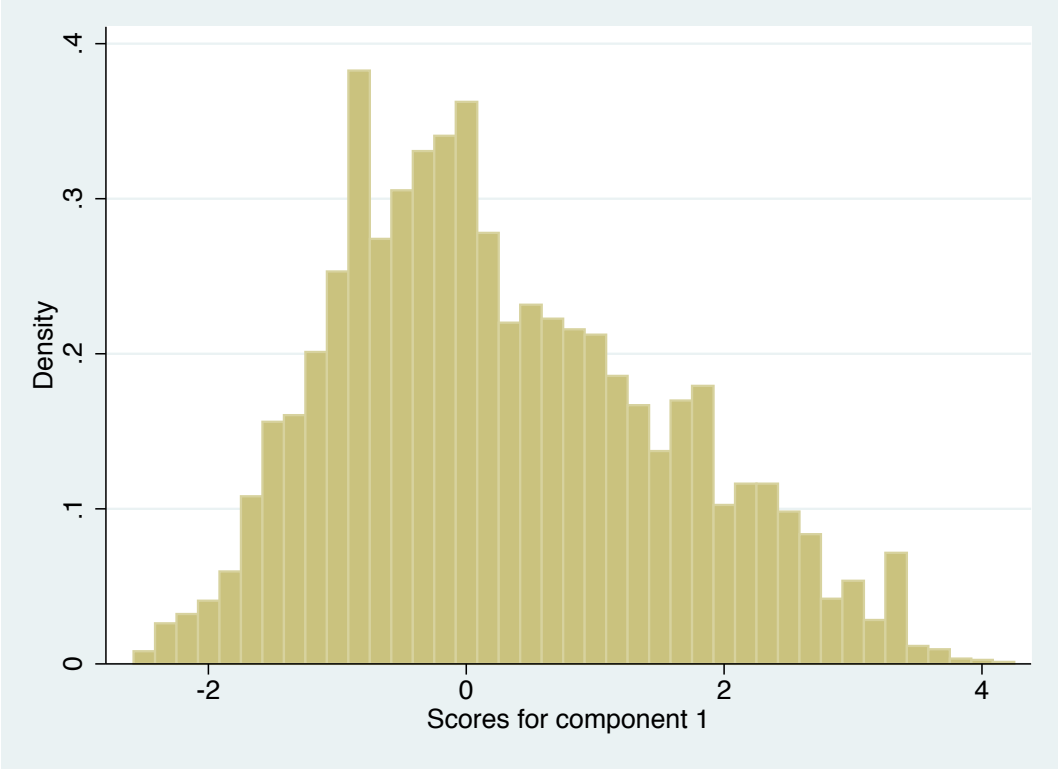

Figure 3A.1: Distribution of consumption – wealth index values

Several other blocks of multicollinear variables are of interest. Therefore, I also used PCA to create indices to summarize: (1) crime experience and fear of crime, (2)

perceptions of government effectiveness, and (3) respondent's report of services and institutions available within the community. For the crime experience and fear of crime index, I include measures of respondents' reported experiences with robbery within the past year, their experiences with attacks within the past year and their overall fear of crime, on scales of zero (never) to four (always).[29] For the perception of government effectiveness, I included measures of respondents perception of government's effectiveness at addressing the following social issues: poverty, income inequality, crime, health and food security. Reports were on scales of one (very badly) to four (very well). Finally, to compute the community services index, I used principal components analysis to reduce questions about the availability of schools, clinics, market, police, paved road, and cellular phone reception in the enumeration area to a single number.[30] The underlying variables in the community services index are indicator variables and reported by the enumerator rather than by the respondent. Thus, I exclude available information on sewage access and electricity access because these may not be directly observable to the enumerator.

The proportion of the total variance explained for each PCA analysis varies by country. The first component of the wealth-consumption principal components analysis explains between 22 and 35 percent of the total variation. The first component for the index of the perception of government explains between 42 and 61 percent of the total variation, while the crime and crime risk first component explains between 47 and 61

[29] The other categories are, over the past year: experienced 1 = once or twice; 2= several times; 3= many times.

[30] I also rescored the DHS zscores to obtain nonzero, positive values to create a DHS Health Gini Coefficient, which included several measures of child under-nutrition as well an information on use of skilled birth attendant, and frequency of antenatal visits. I do not use or present results from the DHS health Gini because the results mask the heterogeneity found. Child-nutritional status measures are statistically significant while pregnancy-based measures are not.

percent. Figure 3 is a histogram of experience of and fear of crime index. 46 percent of respondents have the lowest score, indicating having little to no experience with or fear of crime. The mean is -0.289 and the standard deviation is 1.21.

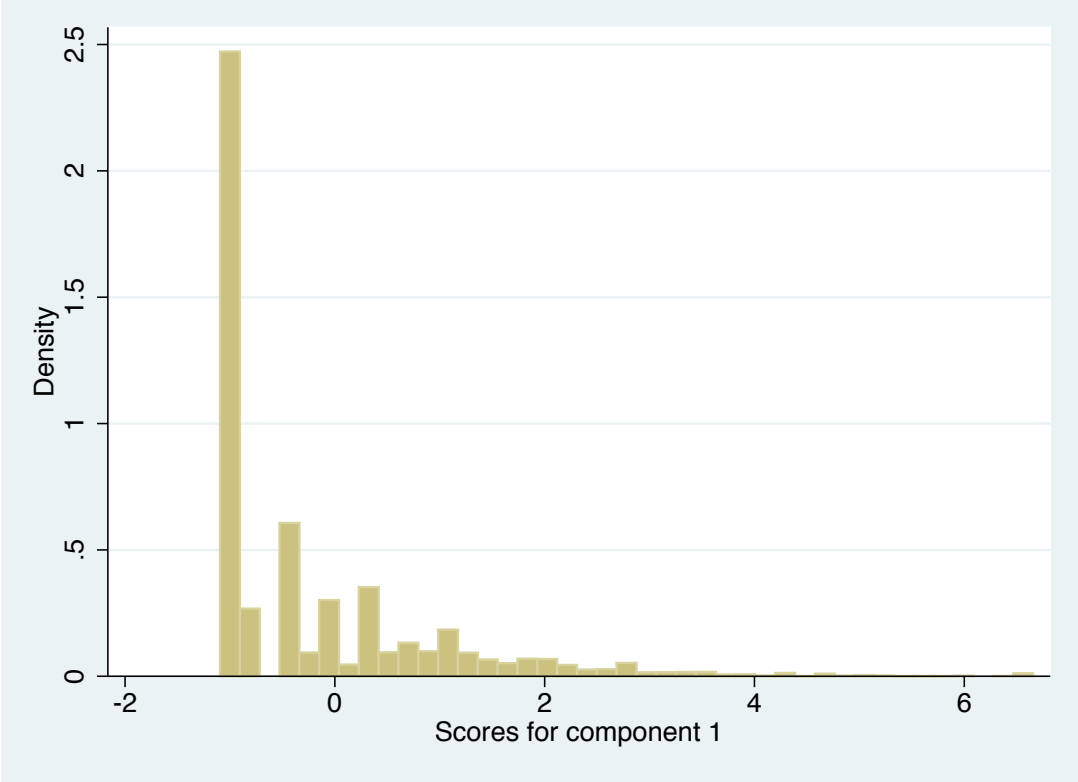

Figure 3A.2: Distribution of crime risk index values

The access to community services first component explains between 37 and 49 percent of total variation. There does not appear to be a consistent pattern across countries across indices.

Table 3A.6: Variation explained by the first component by country

	Consumption-wealth	Perception of government	Crime and crime risk	Access to community services
Benin	0.29	0.61	0.58	0.44
Ghana	0.30	0.56	0.47	0.48
Kenya	0.30	0.42	0.54	0.37
Liberia	0.22	0.52	0.54	0.42
Mali	0.25	0.49	0.62	0.49
Namibia	0.35	0.44	0.60	0.40
Nigeria	0.34	0.56	0.61	0.33
Uganda	0.31	0.49	0.56	0.39
Zambia	0.27	0.54	0.48	0.42
Zimbabwe	0.24	0.60	0.50	0.43

Robustness checks

I compare the rankings of the consumption-wealth index to the rankings of the DHS wealth factors and to the 2008 human development rankings and the 2008 gross national income per capita index International Human Development Indicators http://hdrstats.undp.org/en/indicators/103606.html). None of these alternative measures include precisely the same indicators. In fact, because I include a mixture of assets and consumption measures, the rankings may fall between the DHS wealth index, which intend to capture long-term economic wellbeing, and the national income index, which captures shorter term, more variable, income per capita.

I find that the rankings by country of the consumption-wealth index differs from the other rankings, although it most closely tracks the 2008 gross national income index. Both the consumption-wealth index and the GNI index have the same sets of countries in the top five and in the bottom five. However, the ordering varies between the two indices. The GNI ranks Zimbabwe as much worse off than the consumption-wealth index (9^{th} versus 7^{th}) and the GNI ranks Ghana as worse than the consumption-wealth index (tied for 4^{th} versus 2^{nd}). Given that the GNI captures short-term (annual) economic activity,

these differences are plausible. For example, Zimbabwe, in 2008, was in the midst of hyperinflation and its economy performed poorly. Interestingly, the DHS wealth measure is substantially different than the consumption-wealth index and than the Human Development Index. It may be that the DHS's focus on assets only is too narrow to be aligned with any of the other indices.

Table 3A.7: Comparison of Consumption-wealth rankings with other rankings

	Consumption-wealth score	Consumption-wealth rank	DHS wealth score	DHS rank	2008 HDI rank	2008 GNI index rank
Nigeria	1.052	1	0.321	1	4	2
Ghana	0.574	2	0.120	5	2	4
Namibia	0.507	3	-0.069	9	1	1
Kenya	0.444	4	-0.097	10	3	3
Benin	0.232	5	0.146	4	6	4
Zambia	0.096	6	0.112	6	7	6
Zimbabwe	0.000	7	0.093	7	9	9
Uganda	-0.057	8	0.190	3	5	7
Mali	-0.091	9	0.025	8	8	8
Liberia	-0.276	10	0.317	2	10	10

Source for Human Development Index (HDI) and Gross National Income Index: http://hdrstats.undp.org/en/indicators/103106.html

Internal Coherence

I cannot externally validate the other indices computed with the Afrobarometer data because comparable measures are not available. However, I can examine internal coherence. Again, following Filmer and Pritchett (2001), I examine whether average experience with each of the variables included in each PCA differs markedly by classes defined by the PCA. For example, I examine whether average asset ownership differs by consumption-wealth tercile to determine whether the PCA predicts large asset ownership differences across terciles, as I would expect it to if the assets do vary by economic status.

Most underlying variables are consistent with the ranking generated by the wealth-consumption index. The mean ownership of radio, televisions, motorvehicles and water inside the dwelling increases by wealth-consumption terciles. Thus, radio ownership is 34 percent for the bottom tercile and 95 percent for the top tercile. Similarly, most of the consumption measures also increase as the terciles increase. Two results appear, at first glance, to be inconsistent with these trends. Those in the top tercile report, on average, going without water and fuel than those in the bottom tercile. This may indicate an expectation of better public service provision from those in the upper tercile while those in the bottom. It may also indicate that those in the upper tercile are thinking about access to higher value forms of fuel and water, such as kerosene and potable, treated water, whereas respondents in the bottom tercile consider access to lower-quality fuel and water such as firewood and untreated water. If this interpretation holds, then the results are internally consistent.

Table 3A.8: Scoring coefficients and summary statistics for variables entering the computation of the first principal component for consumption-wealth index

		Across Sample		Means		
Variable	Scoring Coeff.	Means	Std. Dev.	Bottom Tercile	Middle Tercile	Top Tercile
Consumption-wealth index		0.279	1.274	-1.059	0.077	1.725
DHS wealth index		0.140	0.736	-0.142	0.091	0.446
Own radio = 1	0.3616	0.693	0.461	0.340	0.772	0.951
Own tv = 1	0.4967	0.302	0.459	0.003	0.085	0.782
Own motorvehicle = 1	0.2851	0.166	0.372	0.009	0.085	0.388
Water inside dwelling = 1	0.4401	0.280	0.449	0.048	0.233	0.541
Access to food (0-4)	0.2602	2.808	1.213	2.340	2.899	3.163
Access to water (0-4)	-0.2866	2.901	1.291	3.043	2.796	2.884
Access to medical care (0-4)	0.0608	2.637	1.268	2.333	2.643	2.915
Access to fuel (0-4)	-0.3122	3.064	1.193	3.322	2.948	2.936
Access to cash (0-4)	0.2233	1.898	1.369	1.240	1.978	2.434
Cash employment = 1	0.2164	0.527	0.779	0.141	0.497	0.922

Rutstein (2007) has noted that the wealth index generated with DHS data has been

accused of being urban biased. Access to services tends to be higher in urban areas than rural areas and rural assets may be under-represented (Rutstein 2008). Without including detailed lists of rural assets (e.g., farm equipment), the poorest of the poor in rural areas may look indistinguishable from less poor households (Rutstein 2008).[31] Given the lack of information on land and animal holdings in the Afrobarometer survey, it is likely that the same critiques apply to my index.

Table 3A.9: Scoring coefficients and summary statistics for variables entering the computation of the first principal component for perception of government index

		Across Sample		Means		
Variable	Scoring Factors	Means	Std. Dev.	Bottom Tercile	Middle Tercile	Top Tercile
Perception of govt index		-1.084	1.797	-3.020	-1.187	0.974
Govt addressing poverty	0.4705	1.976	0.925	1.176	1.839	2.884
Govt addressing income inequality	0.4647	1.765	0.872	1.094	1.610	2.582
Govt addressing crime	0.4140	2.356	0.969	1.625	2.418	3.009
Govt addressing health	0.4263	2.558	0.953	1.785	2.671	3.190
Govt addressing food insecurity	0.4578	1.933	0.927	1.174	1.838	2.775

The index of the perception of the government's ability to address various social problems is internally consistent. Splitting respondents into terciles by their perception of government index, I find that the mean response for individuals in the bottom tercile to be lower than those in the middle tercile, which is lower than for those in the top tercile.

[31] Rutstein (2008) recommends several solutions, including generating separate wealth indices for rural and for urban households. The rural and urban wealth indices would need to be mapped to national wealth index, using conversion adjustments (Rutstein 2008).

Table 3A.10: Scoring coefficients and summary statistics for variables entering the computation of the first principal component for crime risk index

		Across Sample		Means		
Variable	Scoring Factors	Means	Std. Dev.	Bottom Tercile	Middle Tercile	Top Tercile
Crime and crime risk index		-0.209	1.213	-1.095	-0.426	1.177
Fear crime (0-4)	0.5289	0.778	1.201	0.000	0.909	1.796
Robbed (0-4)	0.6238	0.549	0.867	0.000	0.381	1.429
Attacked (0-4)	0.5755	0.248	0.658	0.000	0.088	0.694

Identifying internal coherence is slightly more challenging for the crime and crime risk index because many people report not experiencing crime. Thus, in the bottom tercile, the mean respondent has been neither attacked or robbed and does not fear crime while the mean respondent in the top tercile reports being attacked slightly less than several times a year, and being robbed, slightly less than once or twice a year. Given that many people in the sample do not directly experience crime (e.g., 84 percent of respondents have never been attacked), the ranking are internally consistent.

Table 3A.11: Scoring coefficients and summary statistics for variables entering the computation of the first principal component for access to community services index

		Across Sample		Means		
Variable	Scoring Factors	Means	Std. Dev.	Bottom Tercile	Middle Tercile	Top Tercile
Access to community services index		-0.573	1.701	-2.475	-0.307	1.457
Access to school	0.0932	0.885	0.319	0.720	0.957	0.996
Access to clinic	0.4574	0.610	0.488	0.069	0.831	1.000
Access to market	0.4090	0.656	0.475	0.269	0.781	0.976
Access to paved road	0.4551	0.378	0.485	0.113	0.375	0.714
Access to police	0.5305	0.343	0.475	0.011	0.154	1.000
Cellphone reception	0.3552	0.752	0.432	0.496	0.819	0.980

The index of access to community services is internally consistent. I find that the mean access to each services increases as the terciles of access to consumption services increase. Therefore, among respondents in the bottom tercile of services, only 7 percent

have access to a health clinic while there is universal access for those in the top tercile.[32]

Inequality measures

I then used the values of respondents' indices variables to estimate a Gini coefficient for urban and rural communities within each country. Traditionally used to understand income inequality, Gini coefficients capture dispersion. Gini coefficients are bounded between zero and one. A score of one indicates complete inequality (one person has all the income) and a score of zero indicates that income is evenly shared across the population. However, Gini coefficients can be used to synthesize other, non-income distributions within communities. Here, I compute Gini coefficients for the dispersion of crime, the dispersion of access to community services, and the dispersion of consumption-wealth within each community. Scores moving from zero to one for the consumption-wealth and community services measures indicate increasing inequality, and the interpretation is equivalent to the standard Gini income inequality measure. Scores closer to one for the crime index also indicates increasing inequality, however, in this case, as the Gini coefficient for crime increases, violence is perpetrated on fewer people. Thus, increasing inequality in crime could have the effect of making some people feel isolated from the threat of crime.

[32] Filmer and Pritchett also use factor analysis as a robustness check. They write " an additional check for robustness is made by using a different methodology for deriving the weights. Although the theoretical underpinnings and the algorithms used in factor analysis are close to those for principal components, the two methodologies differ sufficiently to make factor analysis a possible alternative approach. The first factor de-rived from a model analogous to that described above yields a household ranking that has a .988 Spearman rank correlation with a ranking derived from principal components." (p. 119).

Robustness of results to various estimators and estimation approaches

Models 2-3 are robust to several different measures of community health. Rates of wasting, stunting, and undernourishment among children younger than two years similarly impact subjective wellbeing. All of these measures were computed using Demographic and Health Survey data aggregated at the community level within each country.

Table 3A.12: Descriptive statistics for different estimators of community health

	Obs	Mean	Std. Dev.	Min	Max
Community Characteristics					
% of under 2s stunted in community	14291	0.303	0.060	0.152	0.395
% of under 2s undernourished in community	14291	0.129	0.046	0.067	0.242
% using of skilled birth attendant in last pregnancy	14291	0.766	0.147	0.534	0.985
% using antenatal care services >4 times in last pregnancy	14291	0.621	0.171	0.293	0.907
Rural Community Characteristics					
% of under 2s stunted in community	9146	0.325	0.049	0.221	0.395
% of under 2s undernourished in community	9146	0.139	0.048	0.080	0.242
% using of skilled birth attendant in last pregnancy	9146	0.702	0.137	0.534	0.952
% using antenatal care services >4 times in last pregnancy	9146	0.542	0.147	0.293	0.775
Urban Community Characteristics					
% of under 2s stunted in community	5145	0.266	0.061	0.152	0.345
% of under 2s undernourished in community	5145	0.112	0.037	0.067	0.209
% using of skilled birth attendant in last pregnancy	5145	0.881	0.078	0.764	0.985
% using antenatal care services >4 times in last pregnancy	5145	0.761	0.112	0.575	0.907

However, rates of use of a skilled birth attendant during a woman's last pregnancy and whether a woman had received antenatal care at least four times in her last pregnancy are not statistically significant in this model of SWB. The difference

between child-nutritional status measures and pregnancy-based measures could be attributable to the fact that nutritional status is observable to broader community members, and therefore it may have more of an influence on SWB for respondents without small children in their own households than harder-to-observe antenatal services and birth practices.

Table 3A.13: Model of subjective wellbeing using the prevalence of stunting in the community

Models	(1) Initial model	(2) Community attributes model	(3) Community attributes and inequality model
Sociodemographic Characteristics			
Female = 1	0.0961**	0.111***	0.111***
	(0.0383)	(0.0403)	(0.0403)
Age	-0.0390***	-0.0356***	-0.0351***
	(0.00726)	(0.00805)	(0.00806)
Age squared	0.000374***	0.000344***	0.000340***
	(8.54e-05)	(9.60e-05)	(9.62e-05)
Primary school (some or completed)	0.0232	0.0265	0.0573
	(0.0568)	(0.0606)	(0.0614)
Secondary school (some or completed)	0.426***	0.447***	0.464***
	(0.0613)	(0.0651)	(0.0658)
Post secondary school	0.719***	0.749***	0.777***
	(0.0791)	(0.0833)	(0.0836)
Minority language = 1	-0.0932**	-0.128***	-0.126***
	(0.0397)	(0.0416)	(0.0416)
Religion is not very important	0.306	0.327*	0.310
	(0.187)	(0.193)	(0.193)
Religion is somewhat important	0.243	0.182	0.174
	(0.152)	(0.156)	(0.156)
Religion is very important	0.222	0.185	0.175
	(0.143)	(0.147)	(0.146)
Listen to radio news between monthly and few times a week	0.229***	0.235***	0.219***
	(0.0624)	(0.0668)	(0.0670)
Listen to radio news daily	0.302***	0.306***	0.291***
	(0.0628)	(0.0666)	(0.0667)
Consumption wealth index	0.240***	0.232***	-0.0505
	(0.0183)	(0.0193)	(0.132)
Perception of government index		0.226***	0.227***
		(0.0120)	(0.0120)
Access to community services index		0.0158	-0.0415

		(0.0134)	(0.0378)
Experience and fear of crime index		-0.106***	-0.284
		(0.0177)	(0.196)
Reference group			
% of under 2s stunted in reference group		-2.743	-6.890**
		(2.069)	(2.712)
Reference-group consumption wealth Gini			-3.079**
			(1.449)
Reference-group community services Gini			-1.558
			(1.245)
Reference-group crime Gini			3.489**
			(1.523)
Interactions (contingent effects)			
Interaction of consumption wealth Gini and index			0.692**
			(0.324)
Interaction of community services Gini and index			0.307
			(0.204)
Interaction of crime Gini and index			0.411
			(0.440)
National Level Controls			
National Gini	-9.33e-05	0.0153**	0.0117
	(0.00577)	(0.00619)	(0.00727)
Country GDP growth rate	-0.00803	0.0470***	0.0870***
	(0.00862)	(0.0163)	(0.0199)
Urban = 1	0.197***	0.0545	-0.356
	(0.0444)	(0.142)	(0.239)
Ghana	0.420***	-0.336	-1.235***
	(0.0814)	(0.366)	(0.473)
Kenya	-0.645***	-0.806***	-1.282***
	(0.0845)	(0.187)	(0.251)
Liberia	0.866***	0.598**	0.290
	(0.0843)	(0.256)	(0.294)
Mali	0.319***	0.138	-0.731***
	(0.0608)	(0.175)	(0.282)
Namibia	0.0526	-1.027***	-1.562***
	(0.209)	(0.354)	(0.379)
Nigeria	0.206***	0.0366	-0.292*
	(0.0771)	(0.0987)	(0.161)
Uganda	-0.393***	-0.871***	-1.153***
	(0.0866)	(0.229)	(0.241)
Constant cut1	-2.240***	-2.711***	-4.503**
	(0.342)	(0.833)	(1.935)
Constant cut2	-0.412	-0.820	-2.610
	(0.342)	(0.833)	(1.934)
Constant cut3	1.101***	0.749	-1.039
	(0.342)	(0.833)	(1.933)
Constant cut4	3.364***	3.034***	1.250
	(0.343)	(0.831)	(1.933)
Observations	13,273	12,164	12,164
Pseudo R-squared	0.0452	0.0628	0.0636

Marginal effects (Pr(swb = 1))	0.0912	0.0858	0.0855

Table 3A.14: Model of subjective wellbeing using the prevalence of undernourishment in the community

Models	(1) Initial model	(2) Community attributes model	(3) Community attributes and inequality model
Sociodemographic Characteristics			
Female = 1	0.0961**	0.111***	0.111***
	(0.0383)	(0.0403)	(0.0403)
Age	-0.0390***	-0.0356***	-0.0352***
	(0.00726)	(0.00804)	(0.00804)
Age squared	0.000374***	0.000344***	0.000338***
	(8.54e-05)	(9.59e-05)	(9.60e-05)
Primary school (some or completed)	0.0232	0.0298	0.0539
	(0.0568)	(0.0604)	(0.0614)
Secondary school (some or completed)	0.426***	0.448***	0.458***
	(0.0613)	(0.0651)	(0.0659)
Post secondary school	0.719***	0.750***	0.767***
	(0.0791)	(0.0833)	(0.0838)
Minority language = 1	-0.0932**	-0.125***	-0.120***
	(0.0397)	(0.0417)	(0.0416)
Religion is not very important	0.306	0.322*	0.307
	(0.187)	(0.194)	(0.194)
Religion is somewhat important	0.243	0.177	0.170
	(0.152)	(0.156)	(0.156)
Religion is very important	0.222	0.182	0.172
	(0.143)	(0.147)	(0.147)
Listen to radio news between monthly and few times a week	0.229***	0.236***	0.222***
	(0.0624)	(0.0668)	(0.0669)
Listen to radio news daily	0.302***	0.308***	0.296***
	(0.0628)	(0.0666)	(0.0666)
Consumption wealth index	0.240***	0.232***	-0.0306
	(0.0183)	(0.0193)	(0.131)
Perception of government index		0.226***	0.227***
		(0.0119)	(0.0120)
Access to community services index		0.0135	-0.0307
		(0.0135)	(0.0375)
Experience and fear of crime index		-0.104***	-0.278
		(0.0176)	(0.196)
Reference group			
% of under 2s stunted in reference group		-4.179**	-5.130***
		(1.944)	(1.964)
Reference-group consumption wealth Gini			-1.245
			(1.332)

Reference-group community services Gini			0.0212
			(1.089)
Reference-group crime Gini			4.706***
			(1.477)
Interactions (contingent effects)			
Interaction of consumption wealth Gini and index			0.649**
			(0.323)
Interaction of community services Gini and index			0.244
			(0.203)
Interaction of crime Gini and index			0.401
			(0.441)
National Level Controls			
National Gini	-9.33e-05	0.00517	0.00607
	(0.00577)	(0.00762)	(0.00808)
Country GDP growth rate	-0.00803	0.0240**	0.0394***
	(0.00862)	(0.0101)	(0.0113)
Urban = 1	0.197***	0.116	0.0923
	(0.0444)	(0.0738)	(0.102)
Ghana	0.420***	0.356***	0.198
	(0.0814)	(0.135)	(0.154)
Kenya	-0.645***	-0.627***	-0.739***
	(0.0845)	(0.0907)	(0.0960)
Liberia	0.866***	1.019***	1.103***
	(0.0843)	(0.101)	(0.109)
Mali	0.319***	0.871***	0.517*
	(0.0608)	(0.249)	(0.270)
Namibia	0.0526	-0.358	-0.519*
	(0.209)	(0.265)	(0.285)
Nigeria	0.206***	0.411**	0.376*
	(0.0771)	(0.163)	(0.193)
Uganda	-0.393***	-0.492***	-0.594***
	(0.0866)	(0.103)	(0.157)
Constant cut1	-2.240***	-2.624***	-1.202
	(0.342)	(0.555)	(1.085)
Constant cut2	-0.412	-0.733	0.692
	(0.342)	(0.555)	(1.084)
Constant cut3	1.101***	0.837	2.263**
	(0.342)	(0.555)	(1.084)
Constant cut4	3.364***	3.122***	4.551***
	(0.343)	(0.557)	(1.087)
Observations	13,273	12,164	12,164
Pseudo R-squared	0.0452	0.0629	0.0636
Marginal effects (Pr(swb = 1))	0.0912	0.0858	0.0855

Table 3A.15: Model of subjective wellbeing using the prevalence of use of skilled birth attendant for last birth

Models	(1) Initial model	(2) Community attributes model	(3) Community attributes and inequality model
Sociodemographic Characteristics			
Female = 1	0.0961**	0.111***	0.111***
	(0.0383)	(0.0403)	(0.0403)
Age	-0.0390***	-0.0355***	-0.0351***
	(0.00726)	(0.00804)	(0.00805)
Age squared	0.000374***	0.000343***	0.000338***
	(8.54e-05)	(9.60e-05)	(9.61e-05)
Primary school (some or completed)	0.0232	0.0327	0.0570
	(0.0568)	(0.0605)	(0.0614)
Secondary school (some or completed)	0.426***	0.450***	0.462***
	(0.0613)	(0.0651)	(0.0658)
Post secondary school	0.719***	0.753***	0.777***
	(0.0791)	(0.0833)	(0.0838)
Minority language = 1	-0.0932**	-0.129***	-0.128***
	(0.0397)	(0.0418)	(0.0417)
Religion is not very important	0.306	0.325*	0.312
	(0.187)	(0.194)	(0.194)
Religion is somewhat important	0.243	0.179	0.171
	(0.152)	(0.156)	(0.157)
Religion is very important	0.222	0.184	0.175
	(0.143)	(0.147)	(0.147)
Listen to radio news between monthly and few times a week	0.229***	0.237***	0.221***
	(0.0624)	(0.0668)	(0.0670)
Listen to radio news daily	0.302***	0.308***	0.294***
	(0.0628)	(0.0666)	(0.0666)
Consumption wealth index	0.240***	0.230***	-0.0194
	(0.0183)	(0.0193)	(0.131)
Perception of government index		0.226***	0.227***
		(0.0119)	(0.0120)
Access to community services index		0.0157	-0.0353
		(0.0134)	(0.0382)
Experience and fear of crime index		-0.105***	-0.298
		(0.0177)	(0.196)
Reference group			
% using skilled birth attendant in reference group		0.101	-0.410
		(0.468)	(0.582)
Reference-group consumption wealth Gini			-1.884
			(1.397)
Reference-group community services Gini			0.187

			(1.299)
Reference-group crime Gini			4.614***
			(1.758)
Interactions (contingent effects)			
Interaction of consumption wealth Gini and index			0.611*
			(0.322)
Interaction of community services Gini and index			0.279
			(0.206)
Interaction of crime Gini and index			0.444
			(0.440)
National Level Controls			
National Gini	-9.33e-05	0.0150**	0.0180**
	(0.00577)	(0.00624)	(0.00733)
Country GDP growth rate	-0.00803	0.0319**	0.0374**
	(0.00862)	(0.0129)	(0.0147)
Urban = 1	0.197***	0.211**	0.251**
	(0.0444)	(0.0895)	(0.125)
Ghana	0.420***	0.114	0.00131
	(0.0814)	(0.129)	(0.133)
Kenya	-0.645***	-0.588***	-0.679***
	(0.0845)	(0.0899)	(0.0949)
Liberia	0.866***	0.898***	1.072***
	(0.0843)	(0.123)	(0.144)
Mali	0.319***	0.351***	-0.0790
	(0.0608)	(0.0652)	(0.132)
Namibia	0.0526	-0.686***	-0.808***
	(0.209)	(0.233)	(0.258)
Nigeria	0.206***	0.107	-0.0510
	(0.0771)	(0.0836)	(0.128)
Uganda	-0.393***	-0.596***	-0.667***
	(0.0866)	(0.0938)	(0.158)
Constant cut1	-2.240***	-1.637***	-0.680
	(0.342)	(0.480)	(1.051)
Constant cut2	-0.412	0.254	1.213
	(0.342)	(0.479)	(1.050)
Constant cut3	1.101***	1.823***	2.783***
	(0.342)	(0.479)	(1.051)
Constant cut4	3.364***	4.107***	5.070***
	(0.343)	(0.480)	(1.053)
Observations	13,273	12,164	12,164
Pseudo R-squared	0.0452	0.0628	0.0634
Marginal effects (Pr(swb = 1))	0.0912	0.0858	0.0855

Table 3A.16: Model of subjective wellbeing using the prevalence of receiving antenatal services >4 times in last pregnancy

Models	(1) Initial model	(2) Community attributes model	(3) Community attributes and inequality model
Sociodemographic Characteristics			
Female = 1	0.0961**	0.111***	0.111***
	(0.0383)	(0.0403)	(0.0403)
Age	-0.0390***	-0.0355***	-0.0352***
	(0.00726)	(0.00805)	(0.00806)
Age squared	0.000374***	0.000343***	0.000339***
	(8.54e-05)	(9.60e-05)	(9.62e-05)
Primary school (some or completed)	0.0232	0.0339	0.0562
	(0.0568)	(0.0607)	(0.0614)
Secondary school (some or completed)	0.426***	0.452***	0.461***
	(0.0613)	(0.0653)	(0.0658)
Post secondary school	0.719***	0.756***	0.771***
	(0.0791)	(0.0836)	(0.0838)
Minority language = 1	-0.0932**	-0.130***	-0.125***
	(0.0397)	(0.0417)	(0.0417)
Religion is not very important	0.306	0.325*	0.311
	(0.187)	(0.194)	(0.194)
Religion is somewhat important	0.243	0.178	0.171
	(0.152)	(0.156)	(0.157)
Religion is very important	0.222	0.184	0.174
	(0.143)	(0.147)	(0.147)
Listen to radio news between monthly and few times a week	0.229***	0.236***	0.224***
	(0.0624)	(0.0668)	(0.0670)
Listen to radio news daily	0.302***	0.307***	0.297***
	(0.0628)	(0.0666)	(0.0667)
Consumption wealth index	0.240***	0.230***	-0.0281
	(0.0183)	(0.0194)	(0.132)
Perception of government index		0.227***	0.227***
		(0.0120)	(0.0120)
Access to community services index		0.0154	-0.0325
		(0.0134)	(0.0375)
Experience and fear of crime index		-0.105***	-0.292
		(0.0177)	(0.196)
Reference group			
% using antenatal services >4 times in last pregnancy reference group		-0.111	0.321
		(0.375)	(0.440)
Reference-group consumption wealth Gini			-2.026
			(1.440)
Reference-group community			-0.437

services Gini			
			(1.143)
Reference-group crime Gini			4.028***
			(1.476)
Interactions (contingent effects)			
Interaction of consumption wealth Gini and index			0.638**
			(0.324)
Interaction of community services Gini and index			0.267
			(0.202)
Interaction of crime Gini and index			0.432
			(0.441)
National Level Controls			
National Gini	-9.33e-05	0.0152**	0.0156**
	(0.00577)	(0.00619)	(0.00717)
Country GDP growth rate	-0.00803	0.0291***	0.0471***
	(0.00862)	(0.0103)	(0.0116)
Urban = 1	0.197***	0.246***	0.106
	(0.0444)	(0.0895)	(0.160)
Ghana	0.420***	0.154	-0.114
	(0.0814)	(0.110)	(0.137)
Kenya	-0.645***	-0.594***	-0.667***
	(0.0845)	(0.0935)	(0.0970)
Liberia	0.866***	0.934***	0.969***
	(0.0843)	(0.106)	(0.108)
Mali	0.319***	0.328***	-0.0329
	(0.0608)	(0.104)	(0.152)
Namibia	0.0526	-0.650***	-0.864***
	(0.209)	(0.240)	(0.259)
Nigeria	0.206***	0.103	-0.0458
	(0.0771)	(0.0825)	(0.125)
Uganda	-0.393***	-0.602***	-0.588***
	(0.0866)	(0.0956)	(0.182)
Constant cut1	-2.240***	-1.771***	-0.723
	(0.342)	(0.420)	(1.066)
Constant cut2	-0.412	0.120	1.170
	(0.342)	(0.419)	(1.065)
Constant cut3	1.101***	1.689***	2.741**
	(0.342)	(0.420)	(1.066)
Constant cut4	3.364***	3.973***	5.027***
	(0.343)	(0.421)	(1.068)
Observations	13,273	12,164	12,164
Pseudo R-squared	0.0452	0.0628	0.0634
Marginal effects (Pr(swb = 1))	0.0912	0.0858	0.0855

Robustness of results to alternative estimation

Using an ordinal probit model, I estimate the same series of models and find

the models robust to this alternative estimation approach. The variables' coefficients differ slightly, however, the key variables of interest remain statistically significant, usually falling within the same interval of statistical significance. The probit models' coefficients tend to be slightly lower than the logit estimates. One difference is that the ordinal probit estimation indicates that wasting is statistically significant at the ten percent level in model 2, the community attributes model. It is not statistically significant in the ordinal logit model, although it cannot be rejected at the 13 percent level.

Table 3A.17: Ordinal Probit Results

	(1) Initial model	(2) Community attributes model	(3) Community attributes and inequality model
Sociodemographic Measures			
Female = 1	0.0552**	0.0613***	0.0617***
	(0.0220)	(0.0231)	(0.0231)
Age	-0.0231***	-0.0210***	-0.0209***
	(0.00414)	(0.00454)	(0.00453)
Age squared	0.000221***	0.000200***	0.000199***
	(4.86e-05)	(5.41e-05)	(5.40e-05)
Primary school (some or completed)	0.0147	0.0215	0.0352
	(0.0332)	(0.0351)	(0.0356)
Secondary school (some or completed)	0.242***	0.259***	0.265***
	(0.0353)	(0.0372)	(0.0377)
Post secondary school	0.413***	0.430***	0.439***
	(0.0450)	(0.0473)	(0.0476)
Minority language = 1	-0.0624***	-0.0840***	-0.0811***
	(0.0228)	(0.0239)	(0.0239)
Religion is not very important	0.187*	0.188*	0.182
	(0.106)	(0.110)	(0.110)
Religion is somewhat important	0.147*	0.0981	0.0954
	(0.0864)	(0.0900)	(0.0898)
Religion is very important	0.140*	0.110	0.106
	(0.0808)	(0.0843)	(0.0840)
Listen to radio news between monthly and few times a week	0.125***	0.124***	0.116***
	(0.0362)	(0.0386)	(0.0387)
Listen to radio news daily	0.165***	0.162***	0.155***
	(0.0362)	(0.0382)	(0.0382)
Consumption wealth index	0.136***	0.132***	-0.0154
	(0.0104)	(0.0110)	(0.0746)

Perception of government index		0.129***	0.129***
		(0.00676)	(0.00678)
Access to community services index		0.0100	-0.0189
		(0.00766)	(0.0224)
Experience and fear of crime index		-0.0595***	-0.125
		(0.00986)	(0.115)
Reference group			
% of under 2s wasted in reference group		-1.446*	-2.738***
		(0.874)	(0.987)
Reference-group consumption wealth Gini			-0.652
			(0.756)
Reference-group community services Gini			-0.596
			(0.690)
Reference-group crime Gini			2.464***
			(0.828)
Interactions (contingent effects)			
Interaction of consumption wealth Gini and index			0.367**
			(0.184)
Interaction of community services Gini and index			0.160
			(0.119)
Interaction of crime Gini and index			0.151
			(0.260)
Nation Level Controls			
National Gini	0.00131	0.00569	0.00174
	(0.00334)	(0.00460)	(0.00533)
Country GDP growth rate	-0.000756	0.0208***	0.0315***
	(0.00494)	(0.00555)	(0.00637)
Urban = 1	0.114***	0.0560	-0.0219
	(0.0253)	(0.0542)	(0.0688)
Ghana	0.206***	0.0307	-0.0958
	(0.0461)	(0.0519)	(0.0652)
Kenya	-0.404***	-0.429***	-0.548***
	(0.0487)	(0.0622)	(0.0685)
Liberia	0.502***	0.578***	0.677***
	(0.0470)	(0.0586)	(0.0677)
Mali	0.164***	0.326***	0.109
	(0.0361)	(0.0891)	(0.0991)
Namibia	-0.0198	-0.308**	-0.282
	(0.120)	(0.154)	(0.174)
Nigeria	0.0698	0.0940	0.109
	(0.0437)	(0.0689)	(0.0926)
Uganda	-0.254***	-0.310***	-0.300***
	(0.0493)	(0.0615)	(0.0940)
Constant Cut 1	-1.255***	-1.404***	-1.135*
	(0.196)	(0.350)	(0.676)
Constant Cut 2	-0.206	-0.319	-0.0485
	(0.196)	(0.349)	(0.675)
Constant Cut 3	0.711***	0.625*	0.896
	(0.196)	(0.349)	(0.676)
Constant Cut 4	1.926***	1.856***	2.129***
	(0.196)	(0.349)	(0.676)
Observations	13,273	12,164	12,164

Pseudo R-squared	0.0448	0.0621	0.0628
Marginal effects (Pr(swb = 1))	0.0913	0.0851	0.0849

CHAPTER 4

KEEPING UP WITH THE NEIGHBORS?: REVISITING REFERENCE GROUPS AND THEIR IMPLICATIONS FOR RELATIVE DEPRIVATION

Abstract

In the burgeoning literature on subjective wellbeing, the association between own subjective welfare and the economic characteristics of various reference groups is mixed. In studies from high-income countries, improvements in economic wellbeing of a reference group tends to decrease subjective wellbeing, known as relative deprivation. In contrast, in some low-income countries, the relationship between reference group economic and subjective wellbeing is positive for at least some members of the population, such as poorer individuals. Yet, not only does the definition of reference groups vary across much of the reference group literature but also much of the literature relies on analyst-defined reference groups, rather than on respondents' actual social network. Analyzing unique micro-level data from rural Ghana, I find the influence of reference groups' economic status on subjective wellbeing is highly sensitive to reference group definition. As in other studies, improvements to the economic status of spatially-defined reference groups result in relative deprivation. In contrast, utilizing reference groups defined from social network data on gift-receipt or trust yields more complex findings. Respondents' subjective economic welfare improves when these social networks' assets increase and expenditures decrease. That is, respondents feel better when the people they trust or the people they have received gifts from are wealthy but thrifty. This could indicate that respondents hope to draw on their social networks in time of need.

Introduction

Against whom do we benchmark our lives and economic successes? And, do our perceptions change in predictable ways based on who our reference benchmark is? Social science researchers interested in life satisfaction have studied who people benchmark themselves against for the past half-century (Merton and Kitt 1950, Festinger 1954, Runciman 1966, Campbell, Converse, and Rodgers 1976). Over half a century ago, Merton and Kitt (1950) argued individuals do not need to be members of their reference group in order to compare against them. More recently, Frey and Stutzer (2002) argued "There is little doubt that people compare themselves to others and do not use absolute judgments. But it is crucial to know with *which* other people such a comparison is being made" (p. 412). A more recent explosion of research on subjective wellbeing—the study of how people feel about their lives— has made the need to identifying appropriate reference groups pressing once again (Veenhoven 1991, Firebaugh and Schroeder 2009, Clark and Senik 2010, Ravallion 2012; See Diener et al. 2002 for a review).

In studies from high-income countries, research relying on spatial or cohort-reference groups consistently finds that comparing oneself to a relatively wealthier reference group leads to feelings of lower wellbeing, termed "relative deprivation" (Runciman 1966, McBride 2001, Frey and Stutzer 2001, Ferrer-i-Carbonell 2005, Luttmer 2005, Di Tella and MacCulloch 2006, Graham 2009). Relative deprivation occurs when a respondent's subjective wellbeing tends to fall as reference group members (i.e., social comparators) become better off, holding respondent's own income constant (Runciman 1966, Ravallion 2012). In the relatively few studies of reference

group effects in poor and middle-income countries, findings of relative deprivation are more mixed. At least one study relying on reference groups finds evidence of relative deprivation (Fafchamps and Shilpi 2008). In other studies, comparing oneself to relatively better-off reference groups leads to increased – not decreased – feelings of wellbeing for at least some of the population, in particular, poorer individuals; this finding is often referred to as positive external effects (Senik 2004, Kingdon and Knight 2007, Ravallion and Lokshin 2010, and Bookwalter and Dalenberg 2010).

Two factors may contribute to the inconsistent association between reference group economic status and wellbeing in low and middle-income countries. First, the construction of reference groups differs across studies. In low-income countries, the robustness of findings of either relative deprivation or positive external effects to different reference group constructions is unclear. Most recent studies define reference groups as either spatial reference groups or cohort reference groups (appealing to homophily to match on respondent characteristics such as race, gender, occupation, education level, and or religion (see McPherson et al. 2001 for a review of homophily)). As Ravallion (2012) notes, both cohort and spatial reference groups are defined by the analyst, who may not observe what the respondent observes. More recently, some researchers also rely on respondent-identified reference groups (e.g., a respondent's parents (see Bookwalter and Dalenburg 2010) and respondents' assessments of friends and neighbors (see Ravallion and Lokshin 2010)). As of yet, there is little research on whether the actual attributes of respondent-identified social networks matter for subjective wellbeing.

Second, most relative deprivation studies from high-income countries examine the

relationship of wellbeing to relative income. Rather than rely on relative income, which is hard to measure in low-income countries, studies in low- and middle-income countries rely on a variety of relative measures such as assets, consumption, or index-based information (Deaton 2010). Respondents may treat these economic measures differently from one another, experiencing relative deprivation in relation to one measure but not for the other. Thus, a study failing to find relative deprivation with a consumption measure (Ravallion and Lokshin 2010) may be consistent with a study that finds relative deprivation using an index of consumption adequacy (Fafchamps and Shilpi 2008). Understanding how sensitive relative deprivation findings are to the type of economic measure can provide insight into whether and / or how different economic attributes of a reference group affect one's own subjective wellbeing (Zelizer 1994).

Unique data from Ghana enable me to address these two gaps. By comparing three possible categories of reference groups – spatial, spatial-cohort and several social networks – and including two relative deprivation measures – one generated from assets, and the other from expenditures – I examine how the relationship between wellbeing and reference group characteristics changes. I show that wellbeing is sensitive both to reference group definitions and to economic measures. Thus, relative deprivation depends on who the reference group is and what is being measured.

First, I find that people experience relative deprivation when comparing themselves against the asset holdings and expenditures by others in their own village. Second, I find a similar, but weaker effect when respondents compare themselves to people of the same gender and from the same village. Third, and most intriguing, I find that respondents experience higher subjective wellbeing when some social network

members spend less and accumulate assets. In particular, these findings hold for social network members the respondent trusts or the respondent has received a gift from. In other words, people feel better about their own lives when they have close connections to thrifty-savers. I hypothesize that respondents in this sample feel better when their social networks have assets that they can potentially draw on in times of distress – and that respondents don't want their networks spending money that will no longer be available for them. Thus, people's perceptions of their lives are shaped by against whom they are benchmarked. Further, they are more likely to experience relative deprivation when I include only expenditure information rather than when I include asset and expenditure information.

I next review the literature on relative deprivation and social networks. I then present the data, variable construction, and methods. Then, I present findings and robustness checks before concluding with a discussion.

Literature

Many authors have examined reference group effects on wellbeing (see Frank (1997), Frey and Stutzer (2001), and Di Tella and MacCulloch (2006) for reviews). Yet, the majority of the evidence on reference groups and subjective wellbeing is from high-income countries. Researchers find that in developed countries the effect of the reference group's leave-out mean income, wealth, or consumption on individual SWB is negative, holding individual income constant (McBride 2001, Frey and Stutzer 2001, Luttmer 2005 and Ferrer-i-Carbonell 2005, Graham 2009).

Overall, relative deprivation findings in high-income countries do not appear

highly sensitive to reference group construction. Reference groups tend to be defined geospatially or as "others with similar characteristics" by matching on race, gender, occupation, education level, and or religion (Kingdon and Knight 2007, p. 70). Luttmer (2005) uses US public use microdata areas to define geospatial reference groups. Ferrer-i-Carbonell (2005) matches German respondents to a reference group composed of individuals with similar characteristics (education, age, and region). McBride (2001) matches US respondents' characteristics to characteristics (education, health, and sex) of those within a ten-year age cohort of the respondent. All find evidence of relative deprivation.

However, a few US studies with finer-grained data do not always find clear evidence of relative deprivation. McBride (2001) finds that feelings of relative deprivation are attenuated for lower income groups. Further, Firebaugh and Schroeder (2009), using smaller geospatial reference groups than Luttmer, find that the better amenities in higher-income neighborhoods offset any feelings of relative deprivation experienced by poorer people living in these neighborhoods.

The effect of (variably defined) reference groups on subjective wellbeing seems to vary more strongly in low- and middle-income countries, raising the question of whether relative deprivation is "universal" (Fafchamps and Shilpi 2008). A few studies in middle and low-income countries have examined the influence of reference groups' economic attributes on subjective appraisals of consumption, and find consumption-related relative deprivation. Fafchamps and Shilpi (2008) find in Nepal increases in the average appraisal by village or ward of consumables are associated with decreases in respondent's own appraisals of consumables. Using spatial reference groups to study the

effect of average consumption within a community on respondent's appraisal of the adequacy of consumption in Peru, Guillen-Royo (2009) finds that the perceived adequacy of education, housing and clothing is negatively associated with community's average perceptions of consumption of these three products.

In other low- and middle-income countries, a significant and positive relationship between reference group average economic attributes and subjective wellbeing seems to hold, although some findings are sensitive to reference group definitions. Using panel data from Russia, Senik (2004) estimates cohort-reference group income by age, sex, occupation, region, education, and years of experience and finds that (estimated) reference group income is positively associated with subjective wellbeing.

Kingdon and Knight (2007) examine the effect of reference groups for different geographic areas in South Africa. Estimating the relationship between the average income of the neighborhood and individual wellbeing, the authors find a positive relationship. When expanding the geographic unit to include district level average income, they find that comparison group income is no longer significantly associated with wellbeing. Thus, echoing Campbell et al.'s (1976) earlier US findings, they find "within the local cluster, other people's income produces positive externalities on the household's utility. Only when the comparator group is widened to include more distant others (those in the district as a whole) does other people's income appear to create negative spill-overs" (Kingdon and Knight 2007, p. 79).

Bookwalter and Dalenberg (2010), in their study of SWB in South Africa, also test two types of reference groups: spatial reference groups, and respondent's assessments of their parent's wellbeing. At low levels of expenditures, living near wealthier people

improves an individual's wellbeing but that being less well off than one's parents standard increases the likelihood of reporting low levels of life satisfaction (Bookwalter and Dalenberg 2010). Bookwalter and Dalenberg warn, "the traditional emphasis on geographic neighbors and age or educational peers may not provide the best reference group for comparisons. In our analysis, we examine relative standing across numerous dimensions and find the most important effects came from economic standing relative to one's parents" (2010, p. 345).

Ravallion and Lokshin (2010) first estimate the impact of spatial-constructed reference group consumption on wellbeing in Malawi, finding a positive effect. They then ask respondents to assess their friends' and neighbors' economic welfare through economic ladder questions. Ravallion and Lokshin (2010) find in Malawi that among poorer individuals, having (respondent-reported) richer friends and neighbors improves subjective wellbeing. Among non-poor individuals, relative deprivation seems to exist, although the authors point out that this result may be due to a "downward bias in our regression coefficient on the economic welfare of friends and neighbors when own-economic welfare reaches relatively high level" (p. 179).

Researchers have argued that the appropriate reference group is a local community, or other individuals with shared characteristics. In small villages, where it is possible to observe who owns what, spatial definitions may be appropriate (Fafchamps and Shilpi 2008, Bookwalter and Dalenburg 2010). Bookwalter and Dalenburg (2010) point out that housing stock in South Africa is readily observable and vary widely.

Cohort-reference groups share attributes, and may have the same human capital characteristics (Senik 2004). McPherson et al. (2001) in a review on homophily, find that

homophily structures social networks ties, whereby individuals interact with those who are like themselves. They write, "similarity breeds connection" (p. 415). Religion, education, sex, race and ethnicity are all common dimensions of network homophily. One possible implication of network homophily is that network-based reference groups may not be more informative than homophily-based reference groups.

Yet, Ravallion (2012) points out that much of the relative deprivation literature relies on analyst-driven identification of comparison groups. Ravallion's concerns about identification of the appropriate comparison groups have been raised by several researchers (Veenhoven 1991, Bookwalter and Dalenberg 2010, Clark and Senik 2010, Ravallion 2012). Schor (1998) argues that neighbors no longer act as the primary benchmarks against which Americans measure consumption. Rather, Americans compare themselves against those in their broader social space. Each person's social space includes not only friends, family and coworkers but also increased exposure to media has resulted in Americans' "need to measure up with some idealized group" (p. 10). In quantitative studies, who should or should not be included in a reference group is based on social factors the analyst deems important but which may not be important for the respondents. As a result, "the researcher must make some potentially strong identifying assumptions" (Ravallion 2012, p. 18).

One implication is that network-derived reference groups may capture reference group attributes that differ from analyst-generated matched characteristics or spatial measures. Networks are distinct from reference groups in that the members of the networks are likely be known to respondents whereas reference group members may or may not be. The quantity and quality of networks matter for wellbeing (Lawler and Yoon

1998, Helliwell and Putnam 2004, Degli Antoni 2009, Brashears 2010, Lim and Putnam 2010).[33] With the exceptions of Ravallion and Lokshin (2010) and Bookwalter and Dalenburg (2010), there is relatively little work assessing the effects of characteristics of networks on wellbeing. Furthermore, both of these studies rely on *respondents'* assessments of network's economic attributes rather than attributes reported by the network members. Arguably, these studies rely on belief-based reference groups, which may only have a weak relationship to actual network structure. Little is known about role of network members' actual economic characteristic on respondent wellbeing.

Data, variables and method

When testing for the relationship between reference group economic characteristics and subjective wellbeing, not only do analysts choose the comparison reference group, they also choose how to measure the economic attributes of the reference-group. Variations in reference group definitions and in economic measures may contribute to why studies have found both positive externalities associated with reference group attributes and relative deprivation in low- and middle-income countries. Unique data from Ghana allow me to construct different reference groups and two distinct reference group economic measures - assets and expenditures. Using these measures, I can identify how sensitive the respondents' experience of relative deprivation is to both the definition of the reference group and to the type of reference group economic measure.

[33] Lawler and Yoon (1998) find that cohesive networks produce feelings of wellbeing through successful exchanges. Social capital produced through networks affects physical health and wellbeing and social capital is positively correlated with wellbeing (Helliwell and Putnam 2004). Degli Antoni (2009) finds that network quality and density are positively associated with subjective economic welfare. Brashears (2010) and Lim and Putnam (2010) find an inverse relationship between networks and unhappiness.

Data

In 2009, survey data were collected from individuals and their spouses residing in one of four villages in Akwapim (Akuapim) South district in Ghana's eastern region (Goldstein and Udry 1999, Conley and Udry 2001, Walker and Barrett 2011). The villages - Darmang, Konkonuru, Oboadaka, and Pokrom - were purposively sampled in the middle 1990s to reflect broader production system changes away from maize-cassava cultivation toward fruit and vegetable production including export-oriented crops, in particular, pineapple (Goldstein and Udry 1999, Conley and Udry 2001, Vanderpuye-Orgle and Barrett 2008, Conley and Udry 2010).

Surveys were fielded over three waves: 1997-1998, 2004, and 2009. Five rounds of data were collected between February and November during the 2009 wave. Longitudinal data include demographic, consumption, and asset characteristics. In the 2009 wave, modules on ego-centric networks and on subjective welfare measures were also fielded. The subjective perceptions module was fielded in the first round. To be consistent with how individuals perceived their economic wellbeing at the point in time, I use round 1 values for variables that were collected over multiple rounds.[34]

The 1997-98 sample was limited to married households and included approximately 35 households per village. The head and at least one spouse were interviewed. Only married households were eligible to be added in later rounds, although any married households who became single-headed households were included in later waves (Walker and Barrett 2011). In the 2004 round, additional households were

[34] Inflation, at about 16% over the course of 2009, was high, further encouraging me to limit my analysis to round 1 reported values rather than to take (deflated) means or medians across the five rounds.

sampled, increasing the sample to approximately 70 households per village. The 2009 round included surveys of about 150 individuals per village. During the 2009 survey, the estimated populations were 706 in Oboadaka, 1,270 in Konkonuru, 1,768 in Darmang and 2,283 in Pokrom (Walker 2012). Given that the dataset is a random sample of married couples and individuals who were once married, the analysis is limited to those categories. In other words, the findings may not be applicable to single, never married individuals.

Variables

Description of dependent variable

The dependent variable is a subjective measure of welfare that asks respondents to assess his or her household's economic wellbeing relative to other households in this village:

Q: Compared to other households in this village, would you describe your household as…

A: 0= The poorest … 3= About average … 6=The richest

The above question is consistent with other subjective wellbeing questions that ask about life satisfaction but differs somewhat from "happiness" questions (an example of a happiness question is "How happy are you at this stage of your life?" (Veenhoven 1991)). More narrowly defined, this question asks respondents to report assessments of their economic conditions. Happinesss questions in contrast, have been described as "more nebulous in scope" and have been found to be less stable than life satisfaction questions

(Kahneman and Kruegar 2006; Ravallion 2012: 7).[35]

Responses to the subjective wellbeing question fall into seven categories, ranging from "the poorest" to "the richest."[36] No one responded in the lowest category, "the poorest." Due to low response rates of the second to lowest category "among the poorest", I combined this category with those who considered themselves to be "poorer than most." Only two people responded in the highest category, "the richest". Due to the low response rate for the top two categories, I combined the top three responses: those who felt their houses were "among the richest," those considered their households to be "rich", and those who felt their households were "richer than most." Thus, the number of response categories decreased from seven to three.

The initial sample size is 608. The dependent variable is missing 26 responses. As a robustness check, I impute findings, discussed below. As seen in Figure 4.1, the distribution of responses follows a normal curve, with the majority of respondents reporting that their household welfare is "about average" relative to other villagers.[37]

Description of independent variables

[35] Inasmuch as a subjective economic wellbeing question is a component life satisfaction, it is likely that this subjective wellbeing question is similarly stable, if not more so, although I am unaware of any studies examining the stability of this particular question.

[36] In the survey questionnaire, response categories began with 1 = the richest, and ended with 7= the poorest. To aid with interpretation (e.g., increases in objective economic measures are associated with positive changes in the SWB variable), I have reversed these values.

[37] A second, unanchored subjective welfare question was also fielded. This question asks respondents to assess his or her household's welfare right now, but does not specify a benchmark that the respondent should use: *Q: Right now, would you say your household… A: 0= Is destitute … 3=Gets by…. 6=Is very rich.* As Ravallion (2012) argues, anchoring the question to a reference, such as assessing welfare relative to the village, could help attenuate bias resulting from different people using different references (e.g., some people compare their welfare to others in their community while some compare their welfare to all other Ghanaians) (see also Beegle et al. 2011). Other researchers have used similar versions of the second, unanchored question, which allows respondents to state their wellbeing without forcing any particular benchmark (Ravallion and Lokshin 2010). The unachored question is asked after the anchored question, and therefore responses to the first may influence the second (Graham 2009). For these reasons, I limit my analysis to the anchored response.

First, I present motivating models that examine how subjective wellbeing is influenced by own economic characteristics, measured by household assets and per capita expenditures and reference group economic characteristics. Then, following previous findings, I include three categories of variables in my estimation: own economic status, including assets, plots and expenditures; standard controls including demographic characteristics and village-level effects; and reference groups' economic status, computed both as leave-out means and as inequality within each reference group. See Table 4.1.

Table 4.1 here

Own economic status

Assets

Assets include the following: susu balances (informal microfinance), bank balances, value of investments, jewelry and cloth, cash (any foreign currency is converted to GHC), value of building and repairs and agricultural assets. Agricultural assets include food and farm output, other stocks (of seeds and planting materials), farm equipment, durable assets, livestock, and other tradeable goods, such as cash crops.

Over 99% of respondents had assets valued in round 1 of less than 30,000 cedis. Four respondents had assets between 2.5 and 9 times higher than this, and at least twenty times higher than the average asset holdings. I omitted these responses as outliers before proceeding. Given the skewness of the remaining underlying distribution of assets, I log transformed them. To apply a log transformation requires nonzero values. Two respondents from the same household reported negative assets – that is, they owed 118.8 Ghanaian cedis more than their assets were worth. Therefore, I added the lowest asset

value plus one to all respondents, shifting the asset distribution to the right by 119.8 cedis. In the appendix, Figures A2 and A3 show the original kernel density of the assets and their log-transformed kernel densities.

Plots

Not included in the assets measure is the value of the farm plots. Valuing plots is extremely difficult because plot values vary in soil fertility, and access to water and drainage, and the market for plots is relatively thin, making it difficult to determine reasonable plot prices. As an alternative I include a separate measure of the number of plots controlled or owned by the respondent. 37 percent of respondents do not control or own any plots; 79 percent of those not owning or controlling plots are women.

Per capita expenditures

Measuring income is notoriously difficult in low-income countries and perhaps especially for rural residents (Deaton 2010). Therefore, I use per capita expenditures for the month prior to the survey. Expenditure data were collected from both spouses (where applicable) to reflect that different members of the household are often responsible for different parts of the household budget. For example, women purchase food and their spouses may not know precisely how much their wives spent on food during the recall period (Walker 2012). To minimize error, data were collected both on household expenditures and on individual expenditures. I allocate the highest reported household expenditure to all household members and then choose the maximum of the highest reported household expenditure amount or the sum of individual expenditures for our household figure. I divide this figure by the number of people residing in the household to arrive at the per capita measure.

The per capita expenditure measure includes food from family farms and purchases of food, clothing and shoes, transportation, fuel, utilities, rent, entertainment, other small purchases and bulky, abnormal expenditures. Other small purchases such as personal care, cleaning items, household equipment and appliances, lottery tickets, tobacco, and alcohol are also included. Bulky, abnormal expenditures include funeral, wedding, or other ceremonial expenses, vehicle maintenance and repair, schooling, and health. I include these bulkier purchases, if they occurred in round 1, because, while they might not occur every month, they may contribute to people feeling poorer or richer (e.g., an unexpected health expense) when responding to the subjective welfare question.

I do not include assets, such as jewelry, farming equipment, or other durable items that were purchased in round 1 in the expenditure calculation since they are already captured in the asset measure. I exclude as outliers two respondents with per capita expenditures ten times greater than the mean and three times the next maximum value. I log transform per capita consumption to address skewness. Appendix Figures A4 and A5 present the kernel density of the per capita data and of the log-transformed data.

Village fixed effects

While all four villages lie within the same region, nonetheless, the villages do differ. First, population size varies considerably. As of early 2009, the estimated populations were 706 in Oboadaka, 1,270 in Konkonuru, 1,768 in Darmang and 2,283 in Pokrom (Walker 2012). Second, Gini estimates of asset inequality reveal a great deal of variation across communities. Oboadaka, which is the most remote site, has the lowest levels of asset inequality, with Gini coefficient of 0.403. Darmang has the second lowest with

0.533, while Konkonuru and Pokrom have nearly identical Ginis of 0.577 and 0.578, respectively. Third, the soil composition and geology also differ (Goldstein and Udry 1999, Walker 2011). To capture this heterogeneity across community attributes, I include village level fixed effects for the four villages: Darmang, Konkonuru, Oboadaka, and Pokrom in the complete model.

Other standard controls

While many factors are associated with wellbeing, I include standard demographic controls including age, sex, and household size, as well as education.[38] I also include an age-squared term to reflect that people tend to experience declining happiness in their thirties and forties, but increases again as people reach their sixties (see Deiner et al. 2002 for a review). Increased schooling is positively associated with higher subjective welfare. I create education categories to reflect: no schooling (13% of the respondents), at least some primary schooling (23%); at least some junior or middle school (28%); some high school (29%); and beyond high school (6%).

Reference groups

I computed the "leave-out mean", which is the reference group mean calculated without the respondent's own values, for household asset and per expenditure measures.

I computed these two economic measures for three different types of reference groups: a

[38] I estimated models with religion and ethnic minority status but due to the lack of heterogeneity within these categories, I do not report them. In our sample, over 85 percent of the population indicated that its religious affiliation was Christian. Almost 80 percent of respondents are the ethnic majority, Akwapim. Six percent of respondents were members of the broader Akan Nations ethnic group, which includes Akwapim, while about 13.5% reported being "other" ethnicities. Given that neither was significant in the models, I removed them to increase efficiency and degrees of freedom.

spatial reference group, using village-level information; a spatial-cohort reference group, using village and sex categories to capture homophily; and a series of social network reference groups. The first two reference groups are "analyst-defined", whereas the social network reference groups reflect the individual's actual relationships to other respondents. The social network data provide a rich opportunity to understand how different types of social networks may influence subjective welfare measures both differently from each other and differently from analyst-defined reference groups. Thus, I test four different social network reference groups for relative deprivation effects.

Spatial reference group

To compute the spatial reference group, I calculated mean per capita expenditures and mean household assets for each village, leaving out each respondent's own values from the mean calculation.

Spatial-cohort reference group

To construct a reference group of people with similar backgrounds, I split the sample by village and sex to create eight categories of respondent characteristics.[39] Identical to the spatial reference group approach, I then computed leave-out means for reference group household assets and per capita expenditures.

In-sample network reference group:

The social network data were collected using an ego-centric approach. Individuals, rather

[39] Age-village combinations were estimated and are presented in Appendix Table 4A.1. The three age groupings used are 18-29, 30-49, and 50 and older. Due to small sample size, the age-categories were chosen to enable estimation rather than because these age ranges are meaningful in this context. Therefore, I am cautious about interpreting the findings, which indicate a positive relationship between per capita expenditures by age-village group and subjective wellbeing. McPherson et al. (2001) note that age, education levels and religious affiliation may also be characteristics that connect people to one another. Due to a lack of religious or ethnic heterogeneity in the sample, I do not compute reference groups by either. Unfortunately, further dividing the sample by education levels (e.g., no schooling, primary school, and beyond primary) results in categories too small for estimation.

than ties, were sampled. In the 2009 wave, each respondent was asked about his or her in-sample social networks within the village. Each respondent answered several questions, including whether other respondents in their village were relatives, the type and strength of the relationship (i.e., not a friend, acquaintance, distant friend, close friend, or good friend), whether the respondent had given to or received anything of value from the individual, and whether the respondent trusts the person to look after a valuable item (Walker and Barrett, 2011). Respondents in each village knew, on average, 95 of the other approximately 150 respondents from that village (Walker and Barrett, 2011; p. 40).

The ego-centric sampling strategy implies that the network data may be incomplete. In other words, a researcher knows whether a respondent is connected to another respondent but does not know the entire universe of connections for each respondent. Assuming the network is complete may lead to misidentifying certain individuals as isolates just because their network wasn't selected (Wasserman and Faust 2009 (1994)). Using earlier rounds of the Ghana data, and following a similar social network sampling protocol, Udry and Conley (2004) report that some individuals in their sample appear as social isolates, which they argue is a misleading result in villages where virtually no one was completely isolated. Santos and Barrett (2008) refer to situations such as these as resulting from "matches-within-sample" strategies. The authors have found that matches-in-sample yields less accurate pictures of social networks than randomly selecting relationships (e.g., selecting "nodes" rather than "ties") (Santos and Barrett 2008).

To avoid sampling isolates, I treat the networks as egocentric with independence across egocentric networks (Wasserman and Faust 2009). Under this treatment, a means-

based approach does not require network completeness, unlike density measures, which may misrepresent the true underlying network of an individual whose social network has not been included in the matches-in-sample. Thus, I use of the social network data to compute mean attributes of network respondents for each respondent. The ability to compute each network member's own per capita expenditures and household assets is an informative departure from other work, such as Ravallion and Lokshin (2010), who rely on respondents' reports of the economic statuses of their families and neighbors.

Given the richness of information on the types of connections respondents had to one another in the social network data, I computed four different social network reference groups. In each case, I exclude from each respondent's social network his or her spouse(s). First, I estimated mean values for social networks comprised of individuals who the respondent considered to be at least a good friend, labeled "good friend" reference group. Good friends are people the respondent ranked as at least a "3" to the question: "would you consider this person to be: not a friend (=1); an acquaintance (=2); a distant friend (=3); a good friend (=3); a close friend (= 4)?" Second, I estimated a slightly more restrictive social network, limited to those a respondent was willing to trust to look after a valuable item, labeled "trust" reference group. Responses to the question "would you trust this person to look after a valuable item for you?" were either yes or no. I then examined transfer-based social networks. For the third reference group, I computed values for social network members who had ever given the respondent a gift, labeled "received a gift from" reference group. The phrasing of this question is "have you ever received a gift (of money, goods or services) from this person?" Responses were yes or no. Fourth, I computed values for social network members the respondent had given a

gift to, labeled "gave gift to" reference group. Respondents answered yes or no to the question "have you ever given a gift (or money, goods, or services) to this person?"

Giving and receiving gifts may imply a social obligation that trusting or being friends with someone does not (Mauss 2000 (1954)). The transfer-based social networks' relationship to one's own economic wellbeing could be positive or negative. While relative deprivation is one conceivable outcome, the closeness of ties created by gifts could change the dynamic away from one of comparison toward one of support, aspirations, or some other positive externality. Access to several different social network measures allows me to identify how respondent's wellbeing is related to her different social networks, if at all.

The initial sample is 608. Missing data reduced the sample size. In addition to 26 respondents missing dependent variable responses and the six outlying asset and expenditure findings (described above), 39 respondents were missing some combination of per capita expenditures, education level, and / or and age. The social network data also have fewer respondents because some respondents do not report having meaningful social interactions with other respondents. As described above, this does not mean that these respondents were social isolates. In total, the number of observations in each model varies between 537 and 415 respondents. In the section describing robustness checks, I discuss findings from estimates using multiply imputed data.

Method

I estimate a series of identical ordinal logit models that vary only by reference group values to test if the experience of relative deprivation depends on the reference group. The dependent variable, "Compared to other households in this village, would you

describe your household as…" is coded for three responses. There are too few categories to estimate the model with ordinary least squares (Easterlin 2011). Further, ordinal logistic regressions can better incorporate potential differences in scale between response categories that an OLS regression would treat as equivalent. Therefore estimating an ordinal model is a more prudent approach.

The general form of the model is presented below in equation 1:

$$y^* = \alpha + \boldsymbol{I_i'\beta} + \boldsymbol{X_i}'\boldsymbol{\gamma} + \delta_j C_j + \rho_i U + \boldsymbol{RG_i}'\boldsymbol{\theta} + \varepsilon$$

$$y = \begin{cases} 1 \; if \; y* \leq \mu_1 \\ 2 \; if \; \mu_1 < y* \leq \mu_2 \\ 3 \; if \; \mu_2 < y* \leq \mu_3 \\ 4 \; if \; \mu_3 < y* \leq \mu_4 \\ 5 \; if \; \mu_4 < y* \end{cases} \qquad (1)$$

The underlying latent response, y^* is unknown. Observed responses are an ordered set of discrete responses, y, which groups y^* into one of five response categories. The parameter α is a constant; $\boldsymbol{I}_i$ is a vector of individual economic attributes, including the natural logs of household wealth and per capita expenditures. C_j are a series of indicators variable taking a value of one for each of j villages; $\boldsymbol{X_i}$ is a vector of control variables and ε is the error term. $\boldsymbol{X_i}$ includes age and age-squared, gender, and schooling, which have been found in other studies to be consistently important for SWB or important to include as controls (Diener et al 2010; Easterlin et al. 2011). I also include the number of agricultural plots and the household size. $\boldsymbol{RG_i}$ is a vector of the leave-out mean reference group values of per capita expenditures and household assets for respondent i.

Findings, robustness checks, and discussion

Findings

To understand against whom, if anyone, respondents benchmark themselves, and if they

do, whether it impacts their wellbeing positively or negatively, I estimate the relationship between subjective welfare and a series of reference groups: spatial reference groups, village-gender reference groups, and social networks. If relative deprivation is present, a mean value of reference group assets or expenditures should have a negative influence on a respondent's subjective welfare, all else equal. In other words, relative deprivation exists when a marginal increase to a reference group's economic standing leads to a respondent feeling worse off.

Motiving models

To motivate why relative deprivation matters, I first present models estimating the effects of economic characteristics and reference group economic characteristics on subjective wellbeing. I later present fuller models with controls. The motivating models in Table 4.2 include analyst-defined reference group economic characteristics while the motivating models in Table 4.3 include social-network reference group characteristics. In these and all following models, I report robust standard errors to address any unobserved heteroskedasticity.

Table 4.2 here

In Tables 4.2 and 4.3, the coefficient on household assets is strongly, positively associated with subjective well-being. Thus, not surprisingly, having more assets does increase the likelihood that a respondent reports his or her household to be better-off.

The two analyst-defined reference groups presented in Table 4.2 are village-level spatial reference groups and village-gender cohort reference groups. Model 1 presents the estimate of subjective welfare when including the log leave-out means of per capita expenditures and the log leave-out means of household assets for each village. Model 2

presents the estimate of subjective welfare when including the log leave-out mean of per capita expenditures and log leave-out mean of household assets by village and gender cohort. The analyst-defined models indicate that individuals do experience relative deprivation when benchmarked against the leave-out mean asset holdings and per capita expenditures of other villagers.

The gender-village results in model 2 are consistent with the village-only results.[40] Yet, the experience of relative deprivation when using the village-gender reference groups is weaker. Therefore, the village-level reference groups are not substantially more explanatory when disaggregated by gender.

The separate spatially-defined reference groups for men and women indicate that the finding relative deprivation is weaker when men and women compare themselves to same-sex villagers. This is consistent with Udry and Conley (2005) who argue that households may not be a meaningful category for understanding political influence, access to credit, and security of land access for residents of this area. In fact, they argue that the men and women belong to "cleave households" (p. 2). In other words, women [men] may feel more solidarity and less deprivation when benchmarking their wellbeing against other women [men] in their villages.

Table 4.3 here

Turning to the social network measures, I estimate relative deprivation models for four different social networks: a "good friend" reference group (Model 3); a "trusted" reference group (Model 4); a "received a gift from" reference group (Model 5); and a

[40] Due to sample size constraints, I was unable to split the network-based reference groups into female-only contacts male-only contacts. The role of gender-based social networks on wellbeing would be interesting research to pursue, particularly in places with high gender inequity.

"gave a gift to" reference group (Model 6). Results are in Table 4.3. These four reference groups capture the range of relationships that may differently influence subjective welfare. A respondent may be less unlikely to benchmark her subjective welfare against good friends whereas she may be much more aware of the economic status of those with whom she has exchanged gifts. In other words, the networks of good and trusted friends may be less likely to be sources of financial comparison and therefore less likely to impact subjective welfare.

Models 3-6, presented in Table 4.3, show that some social networks' economic characteristics are negatively associated with subjective wellbeing, although this result depends on two components. First, the form of economic measure matters. Coefficients on per capita expenditure measures tend to be negative and sometimes significant while household assets' coefficients are a mix of positive and negative, although insignificant. Second, the type of social network also matters. The coefficients expenditures of members of trusted social networks or social networks composed of individuals who have given the respondent a gift, are significant (at the ten percent level) while the coefficients for other social network characteristics are not. This suggests that certain networks matter more for how people evaluate their lives than others.

Nonetheless, other factors beyond own economic characteristics and reference group characteristics influence wellbeing, and I turn to estimating models with additional demographic characteristics now.

Models with demographic controls

Tables 4.4 and 4.5 present models that incorporate demographic characteristics

and, for the social network models, village fixed effects. Increases in education, particularly with achieving schooling beyond middle school, results in statistically significantly associated with higher log odds of reporting increased subjective welfare. Unlike other studies that routinely find age and sex significantly correlated with subjective welfare, neither a t-test of sex nor a joint chi-square test of age and age-squared is significant.

Table 4.4 here

As in the motivating models, the coefficients on log household assets are highly statistically significant in the full models. An increase in log households is, as expected, positively associated with increased probability of higher levels of subjective welfare. However, neither log per capita expenditure coefficient nor the number of plots controlled by a household coefficient is statistically associated with increased levels of subjective welfare. Goldstein and Udry (2008) argue that land holdings are often ambiguous. The instability in land holdings from season to season may mean that many respondents, especially those in less powerful positions within their villages, do not consider the number of plots important to their subjective economic welfare.

Analyst-defined reference groups and relative deprivation

In Table 4.4, the addition of demographic controls increases the statistical significance and absolute value of the coefficients on reference group economic status. Thus, models 2 and 3 confirm that respondents do benchmark themselves against mean-measures of analyst-defined reference groups and experience relative deprivation when these reference group members acquire assets.

Nonetheless, respondents experience less relative deprivation when benchmarked

against the village-gender cohort than against the entire village. McPherson (2001) notes that there are a number of possible characteristics that a person may have in common with the individuals with whom she or he associates. Unfortunately, the sample is too small to capture finer differentiations of characteristics, such as by age, education level, role in the community, or degree of religiousity. Thus, I cannot rule out the possibility that respondents experience other, different homophily-based effects beyond location and gender.

Social networks and relative deprivation

In Table 4.5, Models 3-6 show whether a respondent's social network's economic status is related to the respondent's own subjective welfare. Model 3, which estimates the economic attributes of a reference group of those identified to be at least a good friend, indicates that the coefficients on the reference group measures are not statistically significantly related to subjective welfare. However, models 4 - 6 indicate that respondents experience deprivation relative to these social networks. First, model 6 captures a statistically significant negative relationship between the mean per capita expenditures of people to whom the respondent has given a gift and the respondent's subjective welfare. Thus, the mean economic status of good friends is not a correlate of a respondent's perception of his or her household's economic standing within the village but an increase in the expenditures of those people the respondents have given a gift to is.

Table 4.5 here

Models 4 and 5 tells a more complex story. As in model 6, the coefficients on the mean per capita expenditures of those two social networks are statistically significantly associated with decreased log odds in subjective welfare, indicating relative deprivation.

However, the coefficients on mean household assets of these reference groups are positively and statistically significantly associated with subjective welfare. That is, respondents seem to feel better about their own subjective welfare when the assets of the people who they trust or who give them gifts increase (all else equal), but feel worse when the same people increase their expenditures. The result is consistent with people treating assets – a store of wealth, not yet spent – and expenditures – purchases already made – as different categories of economic wellbeing. Increases in money spent by a respondent's gift-giving social network or trusted network results in less money being available for a respondent to receive as a gift, all else equal. However, increases in assets means a respondent's social network has more assets they can then give away. Thus, it appears that respondents perceive themselves better off when the people who give them gifts save their money.

Combined, models 3 through 6 indicate that people do benchmark themselves against their social networks, but do so selectively. Social networks involving trust and transfers to the respondent are more meaningful to respondents' economic wellbeing than the attributes of people labeled "good friends". This suggests that networks based on transfers and trust, play a bigger role in who people benchmark themselves against than friendship-based networks, which may not come with the same sorts of strings attached that relationships based on trust and transfers do.

I find that the influence of reference group material wellbeing varies by reference group. The assets and expenditures of analyst-defined reference groups tend to adversely impact respondent subjective wellbeing, indicating relative deprivation. However, the effect of increased wellbeing of respondent-driven reference groups on subjective

wellbeing varies by measure. Asset increases are associated with positive SWB, while expenditure increases are associated with decreased SWB. Combined, these measures suggest respondents feel better about their own lives when their social network members pursue strategies of increasing their wealth, but not spending it, perhaps because respondents see these resources as potentially available to drawn-on in times of need or financial distress.

Robustness checks

To test the strength of the leave-out mean relative deprivation findings, I do a series of robustness checks. First, to test whether the results are sensitive to alternative specifications, I estimate a series of ordinal probit models of leave-out mean measures by reference groups. Estimates for the analyst-defined reference groups are presented in Table 4A.2 in the appendix and estimates for the social networks reference groups are presented in Table 4A.3. I find that the results across all six of the models for this alternative specification are consistent with ordinal logistic results. The probit models' coefficients tend to be slightly lower than the logit estimates. However, the key variables of interest remain statistically significant, usually falling within the same interval of statistical significance.

Second, I test whether including both log leave-out mean assets and log leave-out mean expenditures is necessary for the identification of relative deprivation. Many studies rely on reference group estimates that include one or the other measure, but not both. Estimations of subjective welfare as a function of either reference group mean per capita expenditures or reference group mean household assets for each reference group

are available in the appendix.

Table 4A.4 presents analyst-defined reference group results. Relying on only one type of economic characteristic, either per capita expenditure measures or household asset holdings, results in strong findings of relative deprivation. Using per capita expenditures result in larger negative, statistically significant coefficients indicative of relative deprivation compare to asset holdings. This is different from Table 4.4, which includes both economic characteristics and in which asset holdings have larger negative, statistically significant coefficients. Thus, relying on only one economic measure may hide additional economic factors that contribute to relative deprivation.

Table 4A.5 presents the effect of per capita expenditures and social network log leave-out mean per capita expenditures on wellbeing, while Table 4A.6 presents household assets and social network log leave-out mean household assets. In Table 4A.5, expenditure measures result in relative deprivation for models 3, 4 and 6. Only the coefficient on economic characteristics of those who have given a gift to a respondent is not statistically associated with wellbeing, indicating that relative deprivation based on per capita expenditures alone is dependent on social network definition. Conversely, in Table 4A.6, model 5, respondents' perceptions of their economic welfare are positively and highly statistically significantly related to increases in the mean asset holdings of social networks from whom respondents receive gifts. Thus, model 5 in table 4A.6 shows one example of how having a wealthier reference group can generate a positive externality, which is consistent with other low- and middle-income country findings (Senik 2004, Ravallion and Lokshin 2010). Including only per capita expenditures or household assets of the respondent and reference group in models tells part of the story.

Therefore, including both per capita-based measures and asset-based measures, when available, appears warranted.

Third, I impute results. Demographic characteristics and own economic characteristics are missing very few observations. Education level, the variable with the highest number missing responses (n=42), is missing only seven percent. However, a higher number of respondents are missing social network reference group characteristics. For example, 104 respondents out of 608 respondents do not have any reported values for trusted reference groups. This is perhaps due to the egocentric network sampling approach. Using chained multiple imputation to generate five datasets, I imputed 14 continuous and discrete variables with "missing" responses, including the dependent variable, listed in Appendix Table 4A.7. I deleted the imputed responses for the dependent variable, reducing sample size from 608 to 582 (Johnson and Young, 2011).

Using the imputed data, I re-estimated subjective wellbeing by reference group, presented in Appendix Table 4A.8. The results of models relying on imputed are consistent with the complete case analysis results, with similar coefficients and statistical significance. This indicates that imputed and non-imputed data yield comparable results. As discussed above, an egocentric sampling approach may miss some members of each respondent's reference group. Because imputing social network variables relies on matches-within-sample respondent pool, respondents whose social networks are not included in the original sample have less informative data available from which to impute. Further, imputation may negate the assumption of independence across networks. Therefore, while imputation provides a useful robustness check, I present the non-imputed results.

Summary of main findings

I find that mean-based relative deprivation exists, but findings vary by reference group and economic measure. In this sample, respondents' own wellbeing is adversely influenced by objective measures of wellbeing for residents of the same village, and, less strongly, for same-gender residents. An increase to the expenditures of those who are trusted and those who the respondent has given gifts to adversely impact the respondent's subjective welfare, all else equal, indicative of relative deprivation. Respondents also experience relative deprivation when the people they have received gifts from spend more. However, they feel better off when the same people increase their asset holdings. This suggests that respondents take particular note of the financial status of the people who give them gifts and that they feel better off when the gift-giving group behaves in a way (e.g., saving more and spending less) that increases the total amount available for gifts. Thus, having a social network comprised of trusted or gift-giving thrifty-savers, defined as low-spenders with high assets, improves ones' subjective wellbeing.

Other studies relying on analyst-defined reference groups may fail to find evidence of relative deprivation because the selected reference group is not what respondents use a benchmark. Further, analysts relying on only asset or only expenditures may not be able to observe how respondents treat these two financial categories differently.

Discussion

Subjective wellbeing data have a series of methodological challenges, including

frame of reference bias, lack of stability, and endogeneity. (Frey and Stutzer 2001, Diener et al. 2002, Helliwell and Putnam 2004, Kahneman and Krueger 2006, Kruegar and Schkade 2008, Beegle et al. 2011, Ravallion 2012). These concerns reflect the importance of treating the results as associational rather than causal. Senik (2004) argues that many of the problems associated with the use of subjective data relative to objective measures (or, action-revealed preferences) "result in classical measurement errors which can be benign if they are not correlated with explanatory variables" (p. 2103). Further, some concerns that are theoretically important have not been found to bias findings. Beegle et al. (2011) discuss frame of reference problems (e.g., heterogeneity in what "poor" and "rich" mean) in subjective questions and tests for them. The authors conclude that differences in frames of reference are not an important source of bias in their estimation (Beegle et al. 2011). Krueger and Schkade (2008), testing for reliability of wellbeing questions, write, "the estimated degree of reliability of subjective well-being data is probably high enough to detect effects when they are present in most applications, especially if samples are large and the data are aggregated across people or activities" (p. 1834). Given that my sample is not large, it would be valuable to re-test my findings with larger samples. Models of subjective wellbeing may suffer from endogeneity. Unfortunately, an instrumental variables approach is hampered by the likelihood that variables correlated with social network selection, with assets, or with expenditures are also mostly likely correlated with the dependent variable as well (Senik 2004; see also Ravallion and Lokshin 2010 for a detailed discussion on the lack of feasible instruments). Unobserved characteristics (e.g., an optimistic or pessimistic outlook) may also be driving both reported wellbeing and the so-called explanatory variables.

The structure of the sample also limits my findings. First, the sample is comprised of married or have-been-married individuals. As a result, the findings may not be applicable to single, never married individuals. Second, my findings are drawn from a small region in southern Ghana. Further research is necessary to determine how representative these findings are for other locations within Ghana, within West Africa, or within other poor countries. Third, the social networks data was generated using "matches-within-sampling". Confirming that these findings hold for randomly sampled relationships or for a name-generator based on egocentric network patterns will be an important next step.

Nonetheless, subjective wellbeing measures can shed light on relative deprivation and inequality that is otherwise not directly observable. As Ravallion (2012) notes, subjective wellbeing data "can provide welfare-relevant information that is simply not available in standard objective data" (p. 4). This research contributes to an emerging literature on relative deprivation in less developed countries in two ways. First, my findings confirm that the selection of reference groups influences whether respondents experience relative deprivation. Analyst-defined reference groups, in this study, are more likely to yield evidence of relative deprivation compared to reference groups based on respondents' reported social interactions.

Further research is needed to understand why I find people positively benchmarking themselves against strong social networks, such as trusted networks, but negatively benchmarking themselves to analyst-defined reference groups. One compelling, possible explanation is that in rural sub-Saharan Africa, where state support structures are weak, people feel better about their own lives knowing that trusted people

or people who have given gifts to the respondent, have high-assets and low per capita expenditures. These are the very people one would expect to rely on during times of distress. Such positive feelings may be specific to areas or groups with weak or limited alternative safety nets and thus may not be observable in high-income countries, except among poorer residents (McBride 2001).

My analyst-based reference group results are consistent with relative deprivation findings from high-income countries, which rely on analyst-defined measures. In Ghana, the experience of relative deprivation exists particularly for analyst-defined reference groups. Interestingly, village-level relative deprivation remains relevant in a place such as rural Ghana where residency patterns may not take on the same degree of sorting (e.g., by school zone, by property taxes, by continuing patterns of segregation) that occurs in many high-income countries. In comparison to high-income countries, where strong cohort-based relative deprivation has been found, my significant, but relatively weaker, findings of spatial-cohort relative deprivation may be because the village-gender reference group is not fine-grained enough, a limitation of the data. This is potentially an interesting avenue for future research.

With the exception of the reference group that respondents have given gifts to, my results differ from some studies from low and middle-income countries that fail to find relative deprivation or find positive externalities associated with reference group economic status. Across these studies, the definitions of reference groups vary. One possible explanation consistent with previous research and these findings is that respondents have several different types of reference groups – some of whom are associated with relative deprivation, and some of whom are associated with positive

externalities.

One implication of my research is that when relative deprivation is not found, it may be because respondents treat the studied reference groups studied differently than they treat other reference groups. Studies of wellbeing in low-income countries that rely on analyst-defined reference groups, such as spatial or spatial-gender groups, may not fully capture how people relate to those individuals more heavily involved in their lives.

Future researchers interested in the role of reference groups in low-income countries may benefit from incorporating social network-based reference groups into their estimates. These reference groups yield a complementary set of findings to findings using analyst-defined reference groups. An implication of this study for survey design and model selection for future studies of relative deprivation is that lower-cost geographic or homophily – based reference groups do not appear to produce similar results to ego-centric network sampling. An additional interesting avenue for future research is evaluating relative deprivation using ego-centric networks versus sampling of network ties; it may be that social networks generated from a sampling of ties is even more informative about relative deprivation than the matches-within-sample approach used here.

Thus, my research opens up the possibility that reference group benchmarking is more nuanced and complex than previously addressed in the subjective wellbeing literature. These findings indicate a need to develop a better theorization of the role of reference groups on peoples' lives and suggests that a productive avenue of research should shift the debate away from "who is the right reference group" toward examining the different, and overlapping, roles that various reference groups play in peoples'

perceptions of their lives.

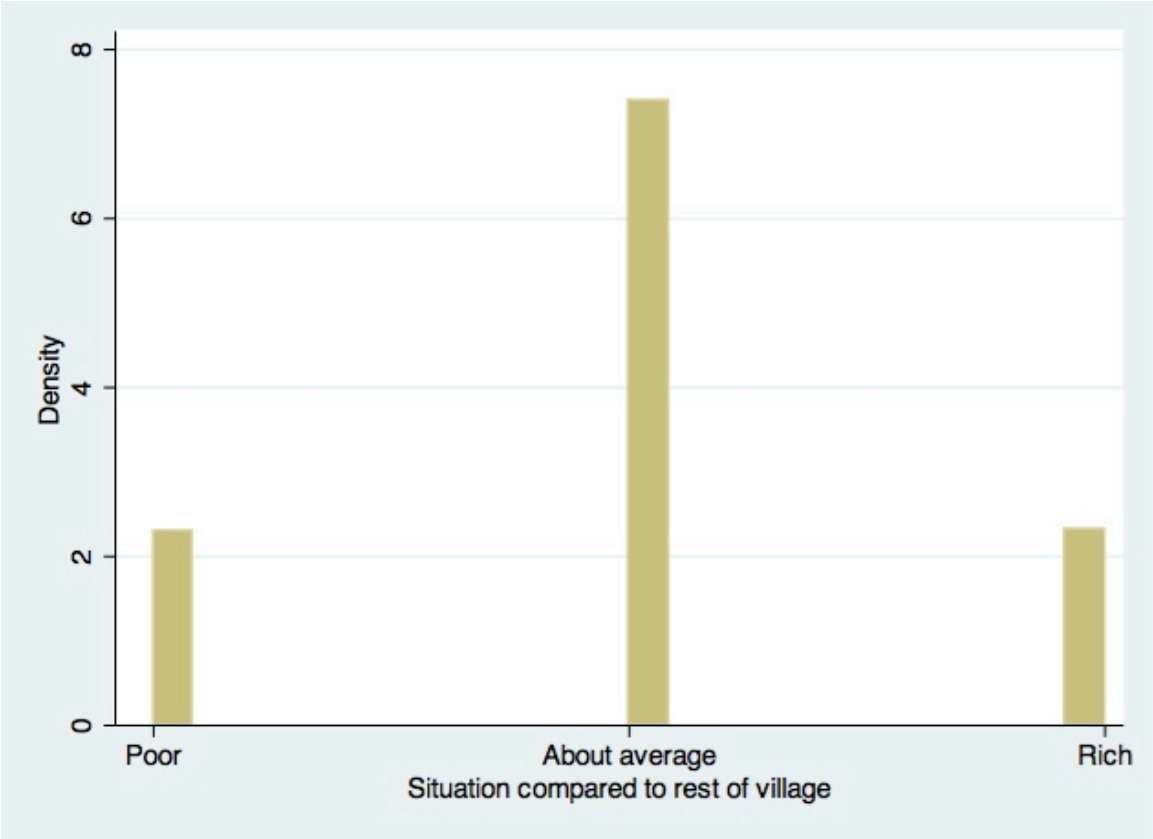

Figure 4.1: Histogram of respondents' subjective welfare relative to their village

Table 4.1: Descriptive Statistics

	Obs	Mean	Std. Dev.
Subjective economic welfare	576	3.003	0.806
Among the poorest	576	0.043	0.204
Poorer than most	576	0.148	0.355
About average	576	0.616	0.487
Richer than most	576	0.148	0.355
Among the richest	576	0.045	0.208
Demographic Characteristics			
Female = 1	576	0.493	0.500
Age	570	43.223	13.734
Household size	576	5.080	2.199
Education level			
No formal education	543	0.133	0.340
Some primary school	543	0.232	0.423
Some middle school	543	0.280	0.449
Some secondary school	543	0.293	0.455
Beyond secondary school	543	0.063	0.242
Economic characteristics			
Log pc exp	576	4.661	0.696
Log hh assets	576	7.150	1.033
Number of plots	576	1.075	1.079
Village			
Darmang	156	0.271	0.445
Pokrom	132	0.226	0.418
Oboadaka	138	0.240	0.427
Konkonuru	152	0.264	0.441
Social network reference groups sizes			
"Giving a gift to" social network	539	143.878	73.548
"Trusted" reference group	539	27.479	30.047
"Receiving a gift from" reference group	574	29.859	28.170
"Good friend" social network	574	31.136	29.352
Leave-out means			
Log leave-out mean of pc exp by village	576	4.869	0.106
Log leave-out mean of assets by village	576	7.655	0.335
Log leave-out mean of pc exp by age and gender	576	4.872	0.043
Log leave-out mean of assets by age and gender	576	7.673	0.324
Log leave-out mean of pc exp of "good friends" reference group	486	4.880	0.378
Log leave-out mean of pc exp of "trusted" reference group	483	4.919	0.306
Log leave-out mean of pc exp of "received a gift from" reference group	522	4.906	0.329
Log leave-out mean of pc exp of "given a gift to" social network	517	4.906	0.319
Log leave-out mean of hh assets of "good friends" reference group	486	7.748	0.750
Log leave-out mean of hh assets of "trusted" reference group	483	7.758	0.650
Log leave-out mean of hh assets of "received a gift from" reference group	522	7.814	0.717
Log leave-out mean of hh assets of "given a gift to" social network	517	7.785	0.708

Table 4.2: Ordinal logistic estimates of the relationship between relative deprivation and subjective welfare: analyst defined reference groups

Models	1	2
	Village reference groups	Village-gender reference groups
Economic characteristics		
Log pc exp	0.118	0.11
	(0.150)	(0.148)
Log hh assets	1.096***	1.096***
	(0.167)	(0.168)
Relative deprivation measures		
Log leave-out mean of pc exp by village	-3.210*	
	(1.652)	
Log leave-out mean of assets by village	-1.300***	
	(0.504)	
Log leave-out mean of pc exp by village and gender		-1.746
		(1.468)
Log leave-out mean of assets by village and gender		-0.833*
		(0.447)
Cut 1	-18.942*	-8.265
	(11.509)	(10.226)
Cut 2	-15.433	-4.774
	(11.496)	(10.228)
Observations	576	576
Pseudo R square	0.131	0.129
Chi square	65.31	64.41
Log likelihood	-466.2	-467.7
Akaike information criterion	1.64	1.645

Table 4.3: Ordinal logistic estimates of the relationship between relative deprivation and subjective welfare: social network reference groups

Models	3	4	5	6
	"Good friend" reference group	"Trusted" reference group	"Received a gift from" reference group	"Given a gift to" reference group
Economic characteristics				
Log pc exp	0.105	0.114	0.168	0.156
	(0.162)	(0.160)	(0.160)	(0.164)
Log hh assets	1.075***	1.001***	1.060***	1.077***
	(0.187)	(0.181)	(0.176)	(0.179)
Relative deprivation measures				
Log leave-out mean of pc exp of "good friends" reference group	-0.264			
	(0.230)			
Log leave-out mean of hh assets of "good friends" reference group	-0.124			
	(0.129)			
Log leave-out mean of pc exp of "trusted" reference group		-0.511*		
		(0.295)		
Log leave-out mean of hh assets of "trusted" reference group		0.103		
		(0.152)		
Log leave-out mean of pc exp of "receiving a gift from" reference group			-0.235	
			(0.277)	
Log leave-out mean of hh assets of "receiving a gift from" reference group			0.027	
			(0.127)	
Log leave-out mean of pc exp of "giving a gift to" social network				-0.471*
				(0.273)
Log leave-out mean of hh assets of "giving a gift to" social network				-0.063
				(0.132)
Cut 1	4.033**	4.189**	5.676***	3.818*
	(1.872)	(2.053)	(2.010)	(1.964)
Cut 2	7.628***	7.595***	9.118***	7.325***
	(1.922)	(2.106)	(2.064)	(2.015)
Observations	486	483	522	517
Pseudo R square	0.123	0.117	0.122	0.126
Chi square	45.93	50.08	55.10	54.51
Log likelihood	-387.3	-398.8	-427.9	-418.4
Akaike information criterion	1.618	1.676	1.662	1.642

Table 4.4: Ordinal logistic estimates of the relationship between relative

deprivation and subjective welfare: analyst defined reference groups with controls

Models	1	2
	Village reference groups	Village and gender reference groups
Demographic characteristics		
Female = 1	0.304	
	(0.222)	
Age	-0.021	-0.017
	(0.041)	(0.041)
Age squared	0.000	0.000
	(0.000)	(0.000)
Some primary school	0.392	0.368
	(0.336)	(0.339)
Some middle school	0.666**	0.594*
	(0.335)	(0.342)
Some secondary school	1.183***	1.025***
	(0.338)	(0.336)
Beyond secondary school	0.987**	0.828**
	(0.407)	(0.404)
Household size	0.009	0.015
	(0.060)	(0.060)
Economic characteristics		
Log pc exp	0.117	0.210
	(0.241)	(0.491)
Log hh assets	1.066***	0.993**
	(0.202)	(0.419)
Number of plots	0.139	0.133
	(0.091)	(0.096)
Relative deprivation measures		
Log leave-out mean of pc exp by village	-3.520**	
	(1.786)	
Log leave-out mean of assets by village	-1.433***	
	(0.544)	
Log leave-out mean of pc exp by village and gender		-2.060
		(1.597)
Log leave-out mean of assets by village and gender		-0.961**
		(0.489)
Cut 1	-21.490*	-10.952
	(12.547)	(11.248)
Cut 2	-17.933	-7.427

	(12.538)	(11.255)
Observations	537	537
Pseudo R square	0.142	0.137
Chi square	79.39	75.15
Log likelihood	-430.3	-432.9
Akaike information criterion	1.658	1.665

Notes:
*** indicates statistical significance at the 1% level; ** at the 5% level; * at the 10% level

Table 4.5: Ordinal logistic estimates of the relationship between relative deprivation and subjective welfare: social network reference groups with controls

Models	3	4	5	6
	"Good friend" reference group	"Trusted" reference group	"Received a gift from" reference group	"Given a gift to" reference group
Demographic characteristics				
Female = 1	0.055	0.159	0.192	0.138
	(0.254)	(0.242)	(0.238)	(0.243)
Age	-0.024	-0.043	-0.017	-0.037
	(0.046)	(0.048)	(0.046)	(0.045)
Age squared	0.000	0.001	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)
Some primary school	0.269	0.092	0.233	0.218
	(0.373)	(0.377)	(0.356)	(0.359)
Some middle school	0.630*	0.547	0.626*	0.593*
	(0.376)	(0.367)	(0.349)	(0.354)
Some secondary school	0.976***	0.904**	1.056***	1.015***
	(0.378)	(0.370)	(0.349)	(0.353)
Beyond secondary school	0.850*	0.708	0.872**	0.809*
	(0.468)	(0.479)	(0.431)	(0.434)
Household size	0.026	0.003	0.010	-0.000
	(0.070)	(0.065)	(0.065)	(0.066)
Economic characteristics				
Log pc exp	0.167	0.082	0.171	0.147
	(0.243)	(0.222)	(0.230)	(0.234)
Log hh assets	0.970***	1.003***	1.013***	1.034***
	(0.233)	(0.231)	(0.219)	(0.222)
Number of plots	0.068	0.105	0.160	0.145
	(0.110)	(0.108)	(0.106)	(0.107)
Relative deprivation measures				
Log leave-out mean of pc exp of "good friends" reference group	-0.481			
	(0.350)			
Log leave-out mean of hh assets of "good friends" reference group	-0.062			
	(0.162)			
Log leave-out mean of pc exp of "trusted" reference group		-0.859**		
		(0.394)		
Log leave-out mean of hh assets of "trusted" reference group		0.361*		
		(0.203)		
Log leave-out mean of pc exp of "receiving a gift from" reference group			-0.512*	
			(0.292)	
Log leave-out mean of hh assets of "receiving a gift from" reference group			0.372*	

			(0.2)	
Log leave-out mean of pc exp of "giving a gift to" social network				-0.675**
				(0.291)
Log leave-out mean of hh assets of "giving a gift to" social network				0.13
				(0.149)
Village-level effects				
Pokrom	-0.005	-0.316	-0.306	-0.072
	(0.317)	(0.352)	(0.308)	(0.300)
Oboadaka	0.641**	0.796***	0.747***	0.688**
	(0.284)	(0.284)	(0.269)	(0.270)
Konkonuru	0.301	0.568*	0.577**	0.525*
	(0.280)	(0.291)	(0.277)	(0.276)
Cut 1	0.228	0.68	2.543**	1.17
	(1.406)	(1.418)	(1.229)	(1.242)
Cut 2	1.136	1.589	3.478***	2.083*
	(1.410)	(1.428)	(1.238)	(1.245)
Cut 3	3.274**	3.626**	5.534***	4.160***
	(1.425)	(1.447)	(1.263)	(1.264)
Cut 4	4.288***	4.631***	6.531***	5.149***
	(1.447)	(1.469)	(1.283)	(1.278)
Observations	453	451	492	486
Pseudo R square	0.139	0.135	0.145	0.141
Chi square	60.61	59.16	72.19	67.87
Log likelihood	-353.6	-364.1	-393.1	-386.1
Akaike information criterion	1.641	1.695	1.671	1.663

Notes:
*** indicates statistical significance at the 1% level; ** at the 5% level; * at the 10% level

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APPENDIX 4.1

ROBUSTNESS CHECKS AND IMPUTATION

Below are kernel density estimates for both assets and per capita expenditures. Log transformations normalize both economic measures.

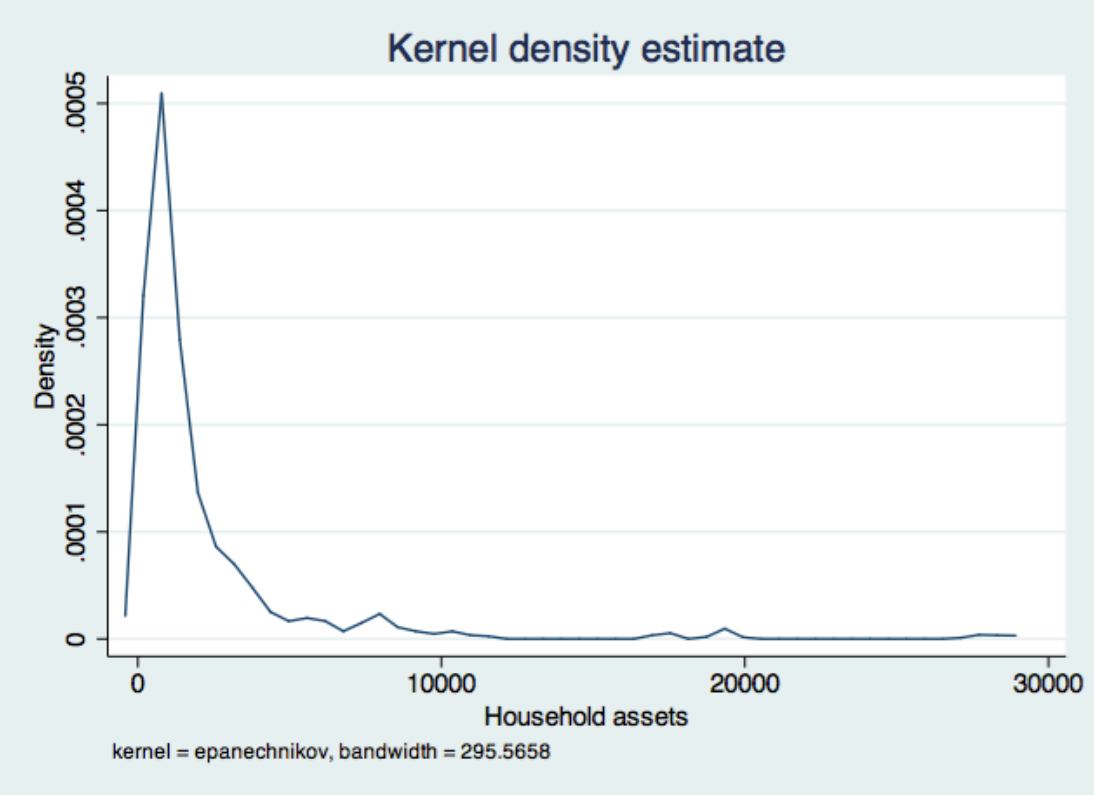

Figure 4A.1: Kernel density of assets

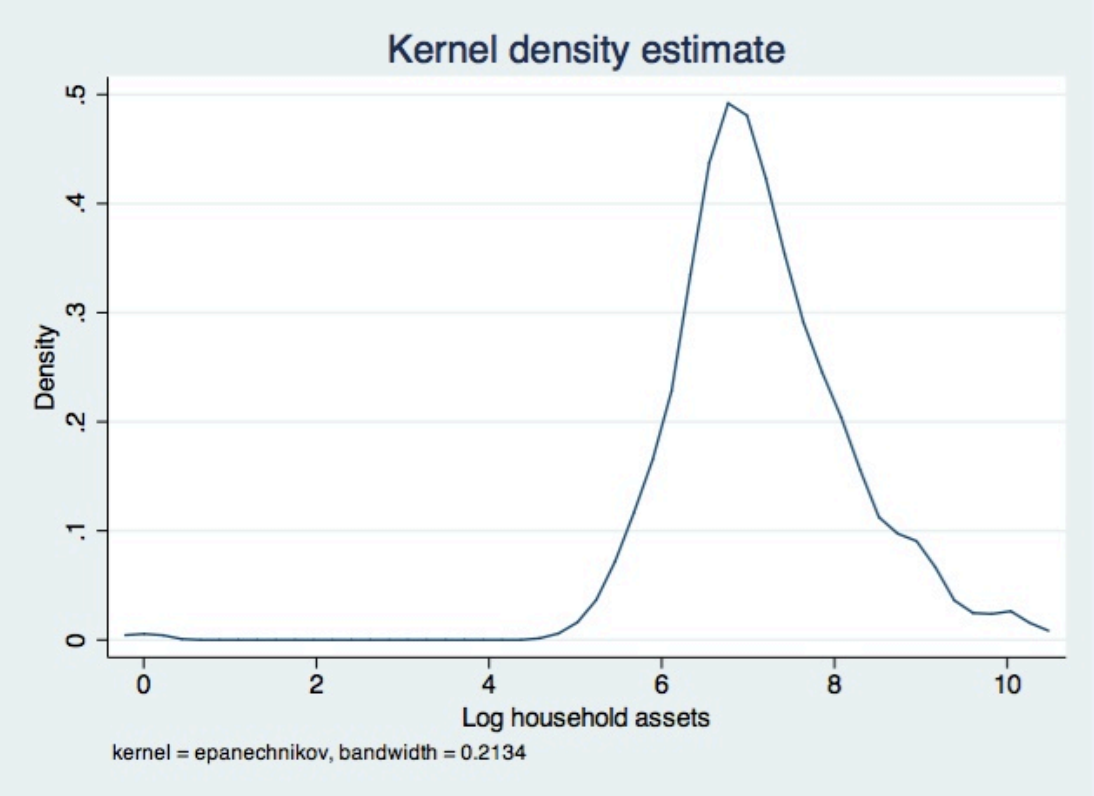

Figure 4A.2: Histogram of natural log of household assets

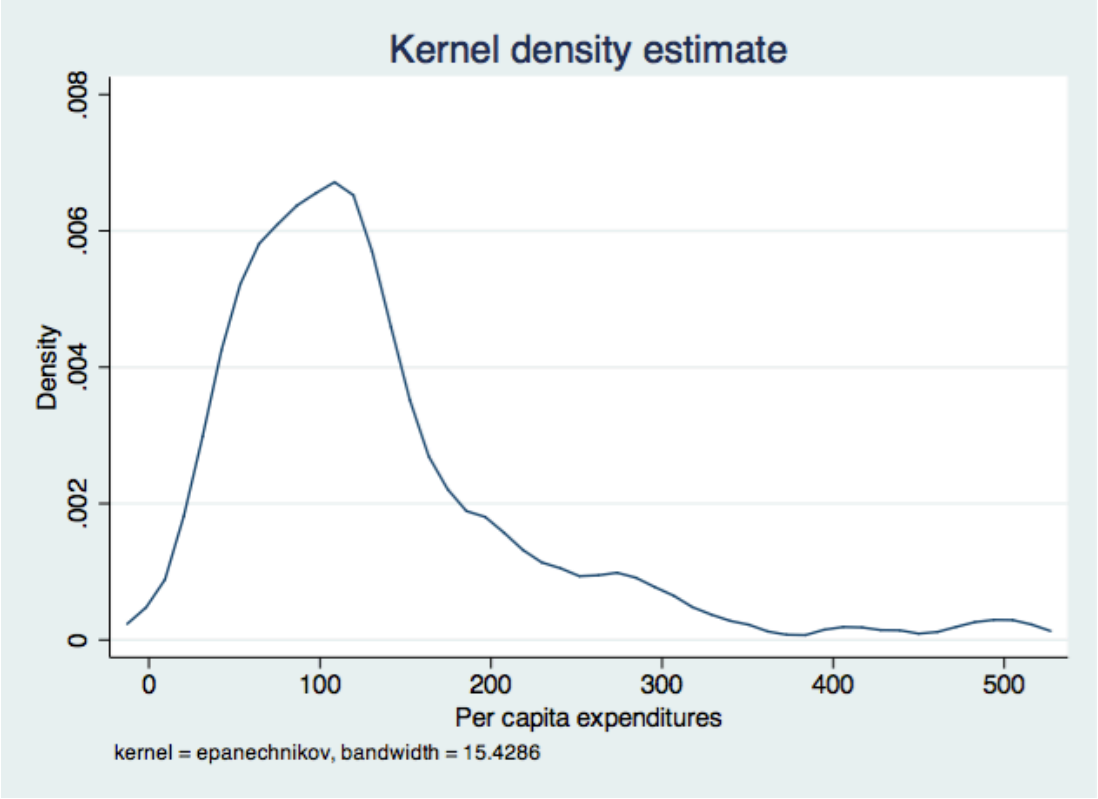

Figure 4A.3: Kernel density of per capita expenditures

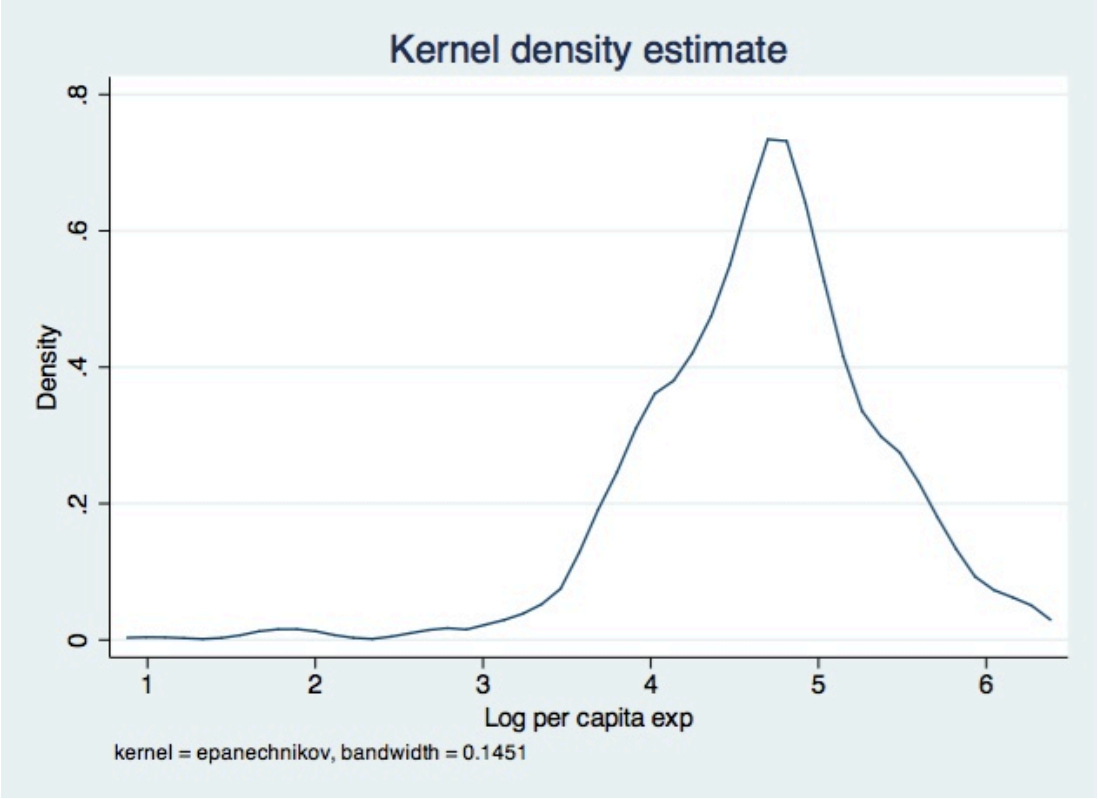

Figure 4A.4: Histogram of natural log of per capita expenditures

Table 4A.1: Ordinal logistic estimates of the relationship between relative deprivation and subjective welfare: analyst defined village-age reference group with controls

	Model
	Village and age reference groups
Demographic characteristics	
Female = 1	0.305
	(0.224)
Age	
Age squared	
Some primary school	0.167
	(0.338)
Some middle school	0.333
	(0.332)
Some secondary school	0.854**
	(0.342)
Beyond secondary school	0.783*
	(0.425)
Household size	0.002
	(0.061)
Economic characteristics	
Log pc exp	0.128
	(0.242)
Log hh assets	1.059***
	(0.205)
Number of plots	0.159*
	(0.093)
Relative deprivation measures	
Log leave-out mean of pc exp by village and age	1.596*
	(0.850)
Log leave-out mean of assets by village and age	0.047
	(0.235)
Cut 1	15.077***
	(5.042)
Cut 2	18.607***
	(5.072)
Observations	543

Pseudo R square	0.139
Chi square	78.61
Log likelihood	-436.3
Akaike information criterion	1.655

Notes:
*** indicates statistical significance at the 1% level; ** at the 5% level; * at the 10% level

Table 4A.2: Ordinal probit estimates of the relationship between relative deprivation and subjective welfare: analyst defined reference groups

Models	1	2
	Village reference groups	Village and gender reference groups
Demographic characteristics		
Female = 1	0.195	
	(0.126)	
Age	-0.011	-0.010
	(0.023)	(0.023)
Age squared	0.000	0.000
	(0.000)	(0.000)
Some primary school	0.236	0.222
	(0.192)	(0.193)
Some middle school	0.387**	0.342*
	(0.192)	(0.195)
Some secondary school	0.689***	0.592***
	(0.192)	(0.192)
Beyond secondary school	0.619***	0.515**
	(0.236)	(0.234)
Household size	0.005	0.008
	(0.034)	(0.033)
Economic characteristics		
Log pc exp	0.101	0.097
	(0.112)	(0.110)
Log hh assets	0.484***	0.490***
	(0.110)	(0.109)
Number of plots	0.093*	0.062
	(0.055)	(0.049)
Relative deprivation measures		
Log leave-out mean of pc exp by village	-2.085**	
	(1.006)	
Log leave-out mean of assets by village	-0.780**	
	(0.307)	
Log leave-out mean of pc exp by village and gender		-1.361
		(0.901)
Log leave-out mean of assets by village and gender		-0.540*
		(0.278)
Cut 1	-12.737*	-7.490
	(7.074)	(6.358)
Cut 2	-10.683	-5.450
	(7.071)	(6.360)
Observations	537	537
Pseudo R square	0.137	0.132
Chi square	76.10	71.10
Log likelihood	-432.7	-435.3

Notes:
*** indicates statistical significance at the 1% level; ** at the 5% level; * at the 10% level

Table 4A.3: Ordinal probit estimates of the relationship between relative deprivation and subjective welfare: social network reference groups

Models	3	4	5	6
	"Good friend" reference group	"Trusted" reference group	"Received a gift from" reference group	"Given a gift to" reference group
Demographic characteristics				
Female = 1	0.045	0.113	0.140	0.108
	(0.142)	(0.137)	(0.134)	(0.136)
Age	-0.009	-0.020	-0.007	-0.017
	(0.026)	(0.027)	(0.026)	(0.026)
Age squared	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Some primary school	0.152	0.073	0.136	0.129
	(0.212)	(0.215)	(0.203)	(0.204)
Some middle school	0.353*	0.310	0.352*	0.332
	(0.214)	(0.211)	(0.201)	(0.202)
Some secondary school	0.561***	0.524**	0.612***	0.587***
	(0.213)	(0.210)	(0.200)	(0.201)
Beyond secondary school	0.547**	0.481*	0.559**	0.525**
	(0.268)	(0.275)	(0.249)	(0.250)
Household size	0.012	0.004	0.006	0.001
	(0.038)	(0.036)	(0.036)	(0.036)
Economic characteristics				
Log pc exp	0.121	0.080	0.126	0.117
	(0.127)	(0.120)	(0.123)	(0.124)
Log hh assets	0.473***	0.485***	0.495***	0.502***
	(0.117)	(0.120)	(0.117)	(0.118)
Number of plots	0.035	0.055	0.088	0.080
	(0.062)	(0.061)	(0.060)	(0.060)
Relative deprivation measures				
Log leave-out mean of pc exp of "good friends" reference group	-0.306			
	(0.199)			
Log leave-out mean of hh assets of "good friends" reference group	-0.013			
	(0.098)			
Log leave-out mean of pc exp of "trusted" reference group		-0.517**		
		(0.223)		
Log leave-out mean of hh assets of "trusted" reference group		0.209*		
		(0.116)		
Log leave-out mean of pc exp of "receiving a gift from" reference group			-0.308*	
			(0.174)	
Log leave-out mean of hh assets of "receiving a gift from" reference group			0.205*	
			(0.109)	

Log leave-out mean of pc exp of "giving a gift to" social network				-0.402**
				(0.176)
Log leave-out mean of hh assets of "giving a gift to" social network				0.076
				(0.087)
Village-level effects				
Pokrom	0.008	-0.144	-0.135	-0.007
	(0.181)	(0.197)	(0.175)	(0.171)
Oboadaka	0.352**	0.435***	0.416***	0.379**
	(0.157)	(0.158)	(0.150)	(0.151)
Konkonuru	0.151	0.305*	0.306**	0.275*
	(0.156)	(0.163)	(0.156)	(0.154)
Cut 1	1.821	2.114	3.787***	2.014
	(1.344)	(1.436)	(1.319)	(1.245)
Cut 2	3.961***	4.155***	5.848***	4.096***
	(1.361)	(1.455)	(1.344)	(1.265)
Observations	453	451	492	486
Pseudo R square	0.134	0.130	0.140	0.136
Chi square	62.07	58.74	69.75	64.51
Log likelihood	-355.5	-366.2	-395.3	-388.4

Notes:
*** indicates statistical significance at the 1% level; ** at the 5% level; * at the 10% level

Table 4A.4: Separate ordinal logit estimates of the relationship between per capita expenditure measures and household asset measures of relative deprivation and subjective welfare: analyst-defined reference groups

	1	2	3	4
	Village reference groups	Village reference groups	Village – gender reference groups	Village – gender reference groups
Demographic characteristics				
Female = 1	0.485**	0.331		
	(0.218)	(0.222)		
Age	0.003	-0.018	0.008	-0.013
	(0.043)	(0.042)	(0.042)	(0.042)
Age squared	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Some primary school	0.397	0.350	0.368	0.323
	(0.341)	(0.337)	(0.339)	(0.337)
Some middle school	0.629*	0.572*	0.567*	0.523
	(0.334)	(0.335)	(0.337)	(0.339)
Some secondary school	1.345***	1.066***	1.181***	0.941***
	(0.339)	(0.337)	(0.331)	(0.333)
Beyond secondary school	1.395***	0.913**	1.179***	0.746*
	(0.427)	(0.413)	(0.412)	(0.400)
Household Size	0.128**	-0.009	0.138***	-0.004
	(0.053)	(0.050)	(0.053)	(0.050)
Economic characteristics				
Log pc exp	0.605***		0.601***	
	(0.191)		(0.188)	
Log hh assets		1.053***		1.052***
		(0.175)		(0.172)
Number of plots	0.206**	0.217**	0.113	0.145*
	(0.096)	(0.096)	(0.084)	(0.086)
Relative deprivation measures				
Log leave-out mean of pc exp by village	-2.209**			
	(0.897)			
Log leave-out mean of assets by village		-0.535*		
		(0.290)		
Log leave-out mean of pc exp by village and gender			-2.196**	
			(0.867)	
Log leave-out mean of assets by village and gender				-0.472*
				(0.285)
Cut 1	-7.279	2.387	-7.530*	2.658
	(4.470)	(2.299)	(4.367)	(2.273)
Cut 2	-4.104	5.917**	-4.378	6.170***
	(4.473)	(2.319)	(4.370)	(2.296)
Observations	537	537	537	537

Pseudo R square	0.0674	0.138	0.0624	0.135
Chi square	61.21	68.94	57.86	64.86
Log-likelihood	-467.7	-432.3	-470.2	-434.0

Notes:
*** indicates statistical significance at the 1% level; ** at the 5% level; * at the 10% level

Table 4A.5: Separate ordinal logit estimates of the relationship between per capita expenditure measures of relative deprivation and subjective welfare: social networks reference groups

Models	3	4	5	6
	"Good friend" reference group	"Trusted" reference group	"Received a gift from" reference group	"Given a gift to" reference group
Demographic characteristics				
Female = 1	0.237	0.299	0.416*	0.358
	(0.250)	(0.238)	(0.236)	(0.240)
Age	-0.012	-0.015	0.011	-0.006
	(0.044)	(0.048)	(0.048)	(0.048)
Age squared	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.001)	(0.001)
Some primary school	0.269	0.134	0.307	0.280
	(0.375)	(0.383)	(0.360)	(0.363)
Some middle school	0.601	0.473	0.657*	0.632*
	(0.380)	(0.376)	(0.356)	(0.360)
Some secondary school	1.237***	1.107***	1.345***	1.320***
	(0.379)	(0.379)	(0.357)	(0.361)
Beyond secondary school	1.341***	1.159**	1.319***	1.293***
	(0.465)	(0.493)	(0.441)	(0.446)
Household size	0.145**	0.125**	0.139**	0.132**
	(0.060)	(0.055)	(0.055)	(0.056)
Economic characteristics				
Log pc exp	0.625***	0.517**	0.638***	0.629***
	(0.214)	(0.212)	(0.215)	(0.214)
Number of plots	0.062	0.103	0.166	0.148
	(0.111)	(0.108)	(0.107)	(0.108)
Relative deprivation measures				
Log leave-out mean of pc exp of "good friends" reference group	-0.740*			
	(0.425)			
Log leave-out mean of pc exp of "trusted" reference group		-0.661*		
		(0.364)		
Log leave-out mean of pc exp of "receiving a gift from" reference group			-0.508	
			(0.398)	
Log leave-out mean of pc exp of "giving a gift to" social network				-0.769**
				(0.385)
Village-level effects				
Pokrom	0.258	0.357	0.350	0.414
	(0.303)	(0.318)	(0.284)	(0.282)
Oboadaka	0.579**	0.624**	0.682***	0.654**
	(0.273)	(0.274)	(0.256)	(0.258)
Konkonuru	-0.064	-0.022	0.033	0.066
	(0.274)	(0.267)	(0.267)	(0.268)
Cut 1	-0.428	-0.759	1.476	-0.365

	(2.392)	(2.355)	(2.374)	(2.246)
Cut 2	2.927	2.392	4.661*	2.858
	(2.406)	(2.373)	(2.398)	(2.258)
Observations	453	451	492	486
Pseudo R square	0.0703	0.0611	0.0689	0.0653
Chi square	57.05	50.10	59.71	55.76
Log likelihood	-381.7	-395.4	-428.1	-420.3

Notes:
*** indicates statistical significance at the 1% level; ** at the 5% level; * at the 10% level

Table 4A.6: Separate ordinal logit estimates of the relationship between household asset measures of relative deprivation and subjective welfare: social networks reference groups

Models	3	4	5	6
	"Good friend" reference group	"Trusted" reference group	"Received a gift from" reference group	"Given a gift to" reference group
Demographic characteristics				
Female = 1	0.063	0.159	0.194	0.141
	(0.255)	(0.242)	(0.237)	(0.241)
Age	-0.016	-0.037	-0.016	-0.038
	(0.045)	(0.048)	(0.045)	(0.045)
Age squared	0.000	0.001	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)
Some primary school	0.270	0.154	0.276	0.270
	(0.370)	(0.371)	(0.352)	(0.356)
Some middle school	0.623*	0.570	0.632*	0.597*
	(0.375)	(0.362)	(0.347)	(0.350)
Some secondary school	0.945**	0.901**	1.070***	1.015***
	(0.373)	(0.367)	(0.347)	(0.352)
Beyond secondary school	0.820*	0.735	0.882**	0.803*
	(0.462)	(0.469)	(0.427)	(0.432)
Household size	0.003	-0.012	-0.017	-0.021
	(0.056)	(0.052)	(0.051)	(0.052)
Economic characteristics				
Log hh assets	1.013***	1.020***	1.056***	1.068***
	(0.207)	(0.207)	(0.195)	(0.197)
Number of plots	0.073	0.109	0.154	0.140
	(0.110)	(0.107)	(0.105)	(0.107)
Relative deprivation measures				
Log leave-out mean of hh assets of "good friends" reference group	-0.102			
	(0.151)			
Log leave-out mean of hh assets of "trusted" reference group		0.207		
		(0.192)		
Log leave-out mean of hh assets of "receiving a gift from" reference group			0.283*	
			(0.172)	
Log leave-out mean of hh assets of "giving a gift to" social network				0.083
				(0.138)
Village-level effects				
Pokrom	0.045	-0.090	-0.225	-0.018
	(0.304)	(0.324)	(0.292)	(0.290)
Oboadaka	0.659**	0.872***	0.756***	0.691**

	(0.283)	(0.279)	(0.268)	(0.268)
Konkonuru	0.216	0.321	0.449*	0.371
	(0.279)	(0.272)	(0.265)	(0.267)
Cut 1	5.469***	7.442***	8.797***	6.673***
	(1.828)	(2.168)	(1.992)	(1.760)
Cut 2	9.163***	10.940***	12.351***	10.253***
	(1.902)	(2.241)	(2.074)	(1.840)
Observations	453	451	492	486
Pseudo R square	0.136	0.130	0.142	0.136
Chi square	53.16	52.05	65.74	60.11
Log likelihood	-354.8	-366.2	-394.6	-388.3

Notes:
*** indicates statistical significance at the 1% level; ** at the 5% level; * at the 10% level

Imputation results

A comparison of complete cases and imputed values reveals that the new averages including the means and standard deviations of the imputed data are consistent with complete cases. Most of the missing responses are due to respondents not having a sampled social network. The total number of complete cases is 413, although, as seen below, each individual model has a higher number of respondents. Overall, the mean economic characteristics tend to be lower for the imputed data. Using the imputations of per capita income and demographic characteristics, values for village and village-gender leave out mean income and assets were computed and therefore are not presented here.

Table 4A.7: Comparing means and standard deviations between complete cases and imputed data

	Complete cases			Imputed data		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Demographic Characteristics						
Perception of wellbeing	582	2.007	0.621	582	2.007	0.621
Female = 1	602	0.488	0.500	608	0.489	0.500
Age	583	43.139	13.711	608	43.250	13.552
Household Size	576	5.080	2.199	608	5.057	2.189
Education level						
Some primary school	566	0.239	0.427	608	0.237	0.425
Some middle school	566	0.279	0.449	608	0.281	0.450
Some secondary school	566	0.288	0.453	608	0.288	0.453
Beyond secondary school	566	0.060	0.238	608	0.061	0.239
Economic characteristics						
Pc expenditures	591	130.743	89.481	608	129.97	89.822
Log leave-out means of						
Pc exp of "good friends" reference group	506	4.877	0.375	608	4.872	0.382
Pc exp of "trusted" reference group	504	4.914	0.305	608	4.910	0.321
Pc exp of "receiving a gift from" reference group	543	4.902	0.326	608	4.903	0.329
Pc exp of "giving a gift to" social network	538	4.905	0.317	608	4.898	0.330
Hh assets of "good friends" reference group	506	7.760	0.748	608	7.747	0.780

Hh assets of "trusted" reference group	504	7.774	0.657	608	7.792	0.672
Hh assets of "receiving a gift from" reference group	543	7.823	0.715	608	7.817	0.719
Hh assets of "giving a gift to" social network	538	7.795	0.707	608	7.782	0.715

Table 4A.8: Ordered logit estimates of subjective economic welfare using data generated by chained multiple imputation

Models	1		2	
	Village reference groups		Village and gender reference groups	
Demographic characteristics				
Female = 1	0.230		0.241	
	(0.215)		(0.216)	
Age	-0.015		-0.016	
	(0.041)		(0.042)	
Age squared	0.000		0.000	
	(0.000)		(0.000)	
Some primary school	0.401		0.394	
	(0.317)		(0.319)	
Some middle school	0.713	**	0.680	**
	(0.317)		(0.321)	
Some secondary school	1.185	***	1.126	***
	(0.330)		(0.331)	
Beyond secondary school	1.025	**	1.023	**
	(0.405)		(0.417)	
Household size	0.015		0.016	
	(0.056)		(0.057)	
Economic characteristics				
Log pc exp	0.115		0.107	
	(0.196)		(0.194)	
Log hh assets	0.974	***	0.972	***
	(0.184)		(0.184)	
Number of plots	0.152		0.172	*
	(0.094)		(0.096)	
Relative deprivation measures				
Log leave-out mean of pc exp by village	-4.391	**		
	(1.725)			
Log leave-out mean of assets by village	-1.614	***		
	(0.506)			
Log leave-out mean of pc exp by village and gender			-2.501	
			(1.546)	
Log leave-out mean of assets by village and gender			-1.050	**
			(0.463)	
Cut 1	-27.136	**	-13.663	
	(11.977)		(10.824)	
Cut 2	-23.561	**	-10.115	
	(11.961)		(10.824)	
Observations	582		582	

*** p<0.01, ** p<0.05, * p<0.1

Table 4A.8: Ordered logit estimates of subjective wellbeing using data generated by chained multiple imputation (continued)

Models	3		4	
	"Good friend" reference group		"Trusted" reference group	
Demographic characteristics				
Female = 1	0.232		0.239	
	(0.214)		(0.214)	
Age	-0.014		-0.013	
	(0.042)		(0.041)	
Age squared	0.000		0.000	
	(0.000)		(0.000)	
Some primary school	0.429		0.361	
	(0.319)		(0.319)	
Some middle school	0.754	**	0.722	**
	(0.321)		(0.320)	
Some secondary school	1.225	***	1.182	***
	(0.332)		(0.331)	
Beyond secondary school	1.069	***	1.026	**
	(0.275)		(0.408)	
Household size	0.017		0.021	
	(0.057)		(0.056)	
Economic characteristics				
Log pc exp	0.172		0.165	
	(0.203)		(0.197)	
Log hh assets	0.203	***	0.994	***
	(0.185)		(0.184)	
Number of plots	0.146		0.141	
	(0.094)		(0.096)	
Relative deprivation measures				
Log leave-out mean of pc exp of "good friends" reference group	-0.318			
	(0.313)			
Log leave-out mean of pc exp of "trusted" reference group			-0.775	**
			(0.330)	
Log leave-out mean of hh assets of "good friends" reference group	0.031			
	(0.161)			
Log leave-out mean of hh assets of "trusted" reference group			0.351	*
			(0.186)	
Village-level effects				
Pokrom	-0.088		-0.404	
	(0.292)		(0.305)	
Oboadaka	0.690	***	0.686	***
	(0.252)		(0.254)	
Konkonuru	0.273		0.503	*
	(0.258)		(0.273)	
Cut 1	5.906	***	6.122	***
	(1.991)		(2.105)	
Cut 2	9.495	***	9.733	***

		(2.041)	(2.152)
	Observations	582	582

Table 4A.8: Ordered logit estimates of subjective wellbeing using data generated by chained multiple imputation (continued)

Models	5		6	
	"Received a gift from" reference group		"Given a gift to" reference group	
Demographic characteristics				
Female = 1	0.220		0.228	
	(0.216)		(0.215)	
Age	-0.011		-0.012	
	(0.041)		(0.042)	
Age squared	0.000		0.000	
	(0.000)		(0.000)	
Some primary school	0.348		0.361	
	(0.319)		(0.320)	
Some middle school	0.709	**	0.705	**
	(0.320)		(0.321)	
Some secondary school	1.165	***	1.181	***
	(0.333)		(0.334)	
Beyond secondary school	1.044	**	1.048	**
	(0.411)		(0.408)	
Household size	0.014		0.014	
	(0.057)		(0.057)	
Economic characteristics				
Log pc exp	0.168		0.174	
	(0.201)		(0.201)	
Log hh assets	0.986	***	0.983	***
	(0.184)		(0.184)	
Number of plots	0.153		0.153	
	(0.095)		(0.095)	
Relative deprivation measures				
Log leave-out mean of pc exp of "receiving a gift from" reference group	-0.450			
	(0.311)			
Log leave-out mean of pc exp of "giving a gift to" social network			-0.510	
			(0.313)	
Log leave-out mean of hh assets of "receiving a gift from" reference group	0.342	*		
	(0.183)			
Log leave-out mean of hh assets of "giving a gift to" social network			0.211	
			(0.165)	
Village-level effects				
Pokrom	-0.323		-0.230	
	(0.294)		(0.291)	
Oboadaka	0.717	***	0.713	***
	(0.251)		(0.251)	
Konkonuru	0.420		0.378	
	(0.272)		(0.266)	
Cut 1	7.673	***	6.350	***
	(2.164)		(2.062)	

	Cut 2	11.272	***	9.947	***
		(2.222)		(2.114)	
	Observations	582		582	

CHAPTER 5

CONCLUSION

Conclusion

My dissertation examines how social environments influence both decisions and subjective wellbeing. The dissertation has necessarily narrowly detailed which aspects of the social environment matter. However, without such details it is not possible to understand which – and by how much – the various factors of the social environment will matter for development policy, governance policy, programming, and interventions into the lives and livelihoods of residents of low-income countries. My findings indicate that it is not possible to separate an individual's choices or perceptions from her social environment, and particularly not from the degree of inequality within her environment. Ignoring the effect of a social environment on individual behaviors results in only a partial understanding of what motivates individuals' choices. An omission of relevant aspects of the social environment is particularly consequential for studies of respondents in low-income countries, where social environments are highly variable both between and within countries. In this chapter, I discuss implications of findings from them for future research on the intersections of inequality, subjective wellbeing, community attributes and behaviors.

In Chapter 2, using experimental evidence, we analyze how peer monitoring by community members shapes transfer choices in northern Kenya. Social norms of the sharing of food are more likely to be observed when peers monitor a respondent's choice between cash and food. I find peer monitoring induces over 20 percent of respondents to choose the more socially optimal choice of food rather than cash. In

other words, when peers are observing choices, people are more likely to use the opportunity to build their reputations as norm-followers. Whether people choose food to "get credit" with their peers or to avoid social sanctioning later is an interesting avenue for future research. Thus, while the social norms of food sharing do not appear to be binding, the presence of peers does prime some people to choose the reputation-enhancing transfer.

In Chapters 3 and 4, my research aims to advance understanding of when and why Africans feel better or worse about their standard of living. There is an especially large void in understanding if and how individuals' assessments of their own well-being varies with others' assessments and with policy-related variables such as school enrollment, health care, and physical security. In Chapter 3, examining subjective wellbeing for ten sub-Saharan countries, I find first that institutional attributes, such as the level of crime, affect the reported wellbeing of respondents. Second, inequality within spatially-defined reference groups matters for individuals' perceptions of their lives. However, mean-measures for these same reference groups do not influence wellbeing, contrary to other studies. This may be because the spatially-defined reference groups are too large to be used as benchmarks for respondents.

In Chapter 4, using micro-level data from Ghana, I turn to examining the sensitivity of subjective measures of economic welfare to reference group construction. Overall, I find that increases in mean per capita expenditures of respondent-identified social network reference groups are associated with improvements in individuals' perceptions of economic wellbeing. However, the opposite occurs when we use economic characteristics spatially-measured reference

groups. In other words, when members of social networks comprised of trusted individuals or those have given the respondent a gift, the respondent feels better off as well. This indicates that individuals' economic wellbeing is not only sensitive to reference group definition but also that reference groups likely play different roles for individuals. For example, those who are trusted or part of a reciprocity network may be more likely to assist the respondent. Thus, respondents may perceive these reference groups' economic success as a greater source of support for the respondent in a time of need.

Contribution

By analyzing the ways that wellbeing and choices are related to understandings of social environments, including social norms, institutions, and reference groups, I show how the social environment shapes individuals' lived experiences and their perceptions of their lives. Ultimately, failing to incorporate relevant attributes of a respondent's social environment perpetuates a narrow, overly individualistic approach to understanding peoples' motivations, choices, and lives.

My first contribution is that in a social environment with strong social norms of sharing food transfers but not yet similarly developed norm for cash transfers, I find framing effects influence some respondents' choices between cash and food. The very presence of community-members at a moment of decision-making is enough to change the relative worth of different transfers, one of which is indicates greater commitment to a community's sharing norm than the other. Thus, the social environment acts as a direct influence on the likelihood of following established social norms of sharing.

Second, my research using village-level data from Ghana shows that relative

deprivation is sensitive to its definition. My findings indicates that respondents do not treat all reference groups equally. Care should be taken when defining them. In particular, analyst-defined reference groups are more likely to result in feelings of relative deprivation compared to reference groups comprised of social network members. As a result, I move the relative deprivation debate away from whether relative deprivation is or is not universally experienced and refocus it toward identifying who should be included in reference groups.

Third, and relatedly, I do not find consistent evidence of mean-based measures of relative deprivation. I do find some evidence of relative deprivation, particularly for analyst-defined reference groups. However, people tend to experience positive feelings of economic wellbeing when the financial situation of trusted members of their social networks or those who have given them gifts improves.

Fourth, across several sub-Saharan African countries, I also find inequality statistically strongly adversely impacts wellbeing. Inequality-based relative deprivation may be a more universal phenomenon than previously recognized. One implication of my finding of inequality-based relative deprivation is that re-assessment of the broader question of inequality in development may be warranted. People not only do not assess their wellbeing in isolation from one another but also are adversely impacted by inequality. Chapters 3 and 4 lay the groundwork for understanding how reference groups and inequality shape key decision-making in politics, economics, and social life—questions I expect to address in future work.

Future directions for research

My contribution to the study of development in the coming years includes

articulating the relationship between subjective wellbeing and inequality, with an eye toward informing development assistance policy. Further, the relationship between the social environment and wellbeing is likely central to the ways that people make decisions about, adopt, and reject a range of livelihood choices. In future research I will seek to understand how decisions are influenced by wellbeing.

First, I intend to examine the degree to which the 'hedonic treadmill' exists in low-income countries and what factors, if any, contribute to it, with a particular focus on attributes of the social environment. The hedonic treadmill has been used to describe the finding that people have a steady state of happiness, returning to the same or similar level of wellbeing over time, regardless of positive or negative life changes (Brickman and Campbell 1971, Helliwell and Putnam 2004). Kahneman and Krueger (2006) argue that the hedonic treadmill may be better labeled the "aspiration treadmill" to reflect "if people gradually adjust their aspirations to the utility that they normally experience, an improvement of life circumstances would eventually lead them to *report* no higher life satisfaction than they did before, even if they were *experiencing* higher utility than previously" (p. 16). Nonetheless, much of the research on hedonic treadmills is from high-income countries. In rapidly changing low-income countries, do people become inured to improvements in their lives, or do they anchor their wellbeing to an earlier time, when life was substantially different? Findings of a hedonic treadmill would indicate that changes in policies to improve material wellbeing may have little impact on perceptions of wellbeing even as life has changed materially. Yet, my findings of the roles of inequality and the social environment on subjective wellbeing would seem to indicate that policy-related variables could very

much influence wellbeing. Thus, some work on whether the hedonic treadmill or relative deprivation dominates could be valuable.

Second, and relatedly, in places where public services, public programs, or private insurance are becoming more commonplace, I would like to explore how decreasing uncertainty in individuals' lives impacts their perceptions. My work has demonstrated that inequality within group outcomes matters for subjective wellbeing, but whether less dispersion over time in one's *own* set of outcomes improves wellbeing is not yet known. A panel dataset that includes network information and (ideally changes in) resilience building / volatility smoothing institutions or activities could allow me to examine the effects of networks and alternative mechanisms of reducing uncertainty on subjective wellbeing while accounting for some of the heterogeneity across respondents.

The existence of three waves of data for a subset of households in the Ghana data means that I may be able to undertake research on changes to income over time. I could compute the growth (or decline) in income, in assets, changes in family structure, etc. over the past decade for respondents who participated in multiple waves. By so doing, I could establish how the relative stability (or lack thereof) and/or growth of income, assets, etc. contribute to feelings of wellbeing. If own-economic stability is an important component in wellbeing, then I would expect to see people experiencing gyrations in assets (or income) over time report lower subjective wellbeing. By using panel data, I could include individual effects in order to address latent heterogeneity in wellbeing responses due to personality traits and/or genetic factors (Ravallion 2012). Using reference groups would allow me to compute the deviation in the respondents'

own economic fortunes from the reference group average. This would allow me to estimate how a respondent's wellbeing is shaped by whether her economic fortune is changing faster or slower then the assets of the reference-group. In villages with relatively little in or out-migration, this could provide insight into whether attributes from network-defined reference groups over time provide a recurring, updated benchmark or whether respondents limit their benchmarking against reference groups for a "snap-shot" of their current economic status.

Third, identifying the roles that reference groups and institutional attributes and the amount of inequality within them has reinforced my interest in disentangling how differences in subjective economic wellbeing and observed economic condition may shape the decisions individuals make. The gap between objective economic measures and subjective economic wellbeing is worth exploring because it can provide insights into what people feel and value, and therefore, ultimately, how people make decisions. While I'm not yet sure how to estimate this, one approach could be to estimate the difference between rescaled objective and subjective measures on an investment decision, for example, could allow for the examination of whether the degree of difference matters for how people make choices. If so, it could indicate the degree of cautiousness or confidence people feel about their objective economic status and would be a shift toward using wellbeing as an explanatory variable.

Fourth, as people gain access to these services and institutions, social norms about what is appropriate to expect from one's broader social environment and from one's reference group change. Continuing to monitor the degree to which different social norms influence decisions in the face of rapidly changing social environments

can alert us to broader changes within a community.

Fifth, Bookwalter and Dalenburg (2010) raise and discuss the possible problems that could result from individuals within a household reporting on a household-level measure of economic wellbeing. In the Ghana dataset, the subjective economic wellbeing questions ask both husbands and wives about the economic status of a household. In some households, husbands and wives report different levels of wellbeing, although there is no immediately discernable pattern as to whether men or women report higher or lower levels of economic wellbeing. The dataset includes a marital status module, which asks about trust, decision-making, etc. within a marriage. By creating a three category dummy: the same, men report higher than women, women report higher than men and including household fixed effects, I may be able to discern different intra-household level drivers of subjective economic wellbeing. In this way, I may be able to unpack what the circumstances of the individual are within the household and how they influence his or her response.

My research advances our understanding of when and why Africans feel better or worse about their standard of living and challenges some of the core assumptions on subjective wellbeing. I find evidence both that peers shape the choices people make and that social environment, including community attributes and (some) reference groups, influence life perception. In these studies, respondents do not experience positive externalities when comparing themselves to their reference groups. Rather, I find both social-network based relative deprivation and inequality-based relative deprivation. One important finding from my work on inequality is that examining inequality not just at the global level (e.g., across countries) but also at the micro-level

(e.g., within-reference groups) can enhance our understanding of the impact of inequality on peoples' lives. My dissertation research thus lays the groundwork for future research developing more nuanced explanations of how perceptions of wellbeing influence the decisions people make, particularly related to participation in development, political action, and risk taking.

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